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Textron Defense Systems

Wilmington, Massachusetts

Environmental Survey of Textron Cape Operations J-3 Range, Sandwich, MA

ENSR Consulting and Engineering

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1.0 INTRODUCTION

1.1 Purpose

ENSR Consulting and Engineering was retained by Textron Defense Systems (Textron) to perform an Environmental Survey of the Textron Cape Operations J-3 Range (J-3 Range) on Otis Air Force Base in Sandwich, Massachusetts. The purpose of this survey is to determine potential environmental liability resulting from the use of the J-3 Range by Textron Cape Operations.

1.2 Scope

The survey phase conducted here is the initial phase of a tiered approach to development of an Environmental Baseline Study (EBS). An EBS is required of all Army property transactions including lease renewals, as is the case with the J-3 Range. This investigation was done in accordance with Army Regulation AR-200-1, specifically Section 7 of Appendix B, a visual inspection of the property, interviews with individuals knowledgeable about the site, a review of available site and local agency files, a review of underground storage tank permit and license records, and a review of the previous investigation conducted on the Massachusetts Military Reservation (MMR).

This report has relied upon existing information provided by Textron Defense System. Much of the baseline information was obtained from the report entitled "Environmental Management Analysis Program for the Massachusetts Military Reservation " dated October 1991 (References to this document shall be made using a citation as follows: MMR Report, Oct. 1991, p xyz).

1.3 Organization of Report

This section is followed by Section 2, which includes a general description of the site, a discussion of current and historical land uses, a description of regional/site soils, geology, hydrogeology, surface hydrology, and meteorology; and an evaluation of on-site noise. Sections 3 and 4 provide the results of the on-site investigation and evaluation of the ecological baseline. Section 3 includes the condition of on-site operations that may pose a potential environmental concern. Section 4 provides an evaluation of the site relative to presence or absence of various ecological components. Following the on-site information is a description of current surrounding land uses and a summary of known or potential human

populations around the site; and an evaluation of the site proximity to various planning and wildlife areas. Sections 6 and 7 provide a description of the areas of potential environmental concern, and a summary of findings and conclusions based on the information gathered and reviewed for this report. Section 8 provides a description of the Study Limitations of this report (other than those mentioned in Section 1.2 above).

2.0 SITE DESCRIPTION AND CHARACTERIZATION

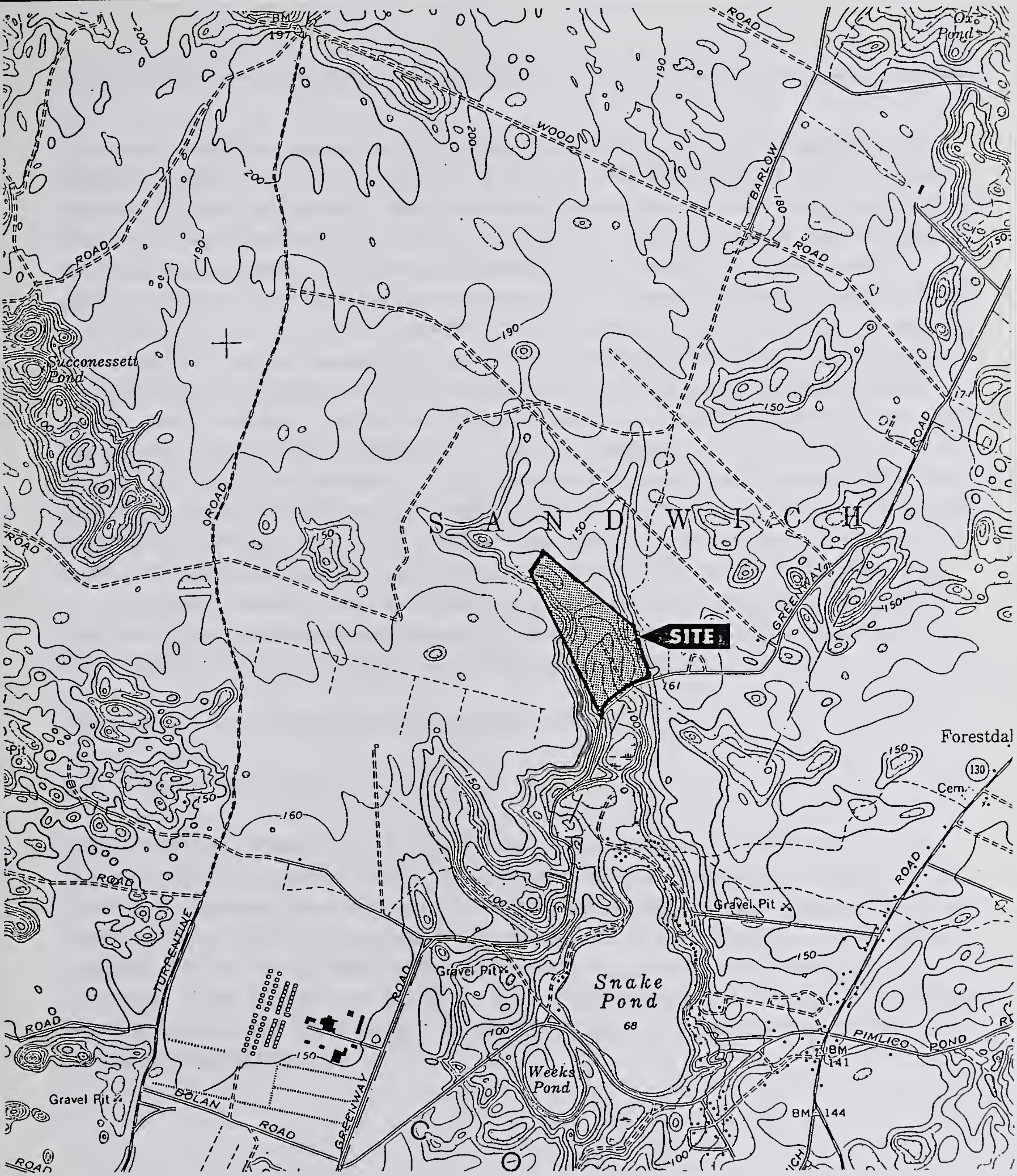
2.1 Site Location and Description

The J-3 Range consists of a 29 acre parcel of land located on the western side of Greenway Road, within the Massachusetts Military Reservation in Sandwich, Massachusetts (See Figure 2-1: Site Location Map). The J-3 Range extends approximately 1,500 feet north/northwest of Greenway Road. The majority of the property is cleared, with stands of trees around the buildings at the southeast end of the property (near Greenway Road) and bordering the perimeter. The J-3 Range is abutted by woodland to the north, east and west, and by Greenway Road to the South. Across Greenway Road is more undeveloped land extending to the MMR property line. The on-site developments consist of six buildings (labeled J-3-1, J-3-3, J-3-4, ~~J-3-6~~; J-3-6, J-3-7 and J-3-9); several trailers; numerous storage sheds; seven munitions bunkers (labeled 5-1, 5-2, 5-3, 5-4, 5-A, 5-B and 5-C); two towers used for testing (one 40 ft. and one 80 ft.); several nets, metal walls, and concrete blocks used in stopping the warheads when launched; an X-ray building (used to X-ray the warheads); and a camera building. The testing area also includes a launching mechanism for the warheads and several concrete pads used in testing the penetration capabilities of the warheads. See Figure 2-2:Site Plan for building and operations locations.

2.2 Current Land Use (including waste generation, disposal and underground storage tanks)

The J-3 Range currently performs reverse ballistic impact, explosive testing and loading, ammunition firing and other munitions testing operations. Many of the testing activities are photographed and the film is developed in building J-3-6.

Wastes generated at the facility include solid waste, sanitary wastewater, and very small quantities of non-regulated waste and hazardous waste chemicals from the photo-development process. The facility is registered with the Massachusetts Department of Environmental Protection (DEP) as a very small quantity generator (VSQG) of hazardous waste (I.D. # MAV000012112) (See Appendix A for VSQG documentation). According the Textron records, the non-regulated wastes generated Include Kodak Developer GBX, and Kodak Fixer, and the hazardous waste generated is an acetic acid stop bath. (See Section 3.4 for a discussion of waste storage and handling).



SOURCE:
U.S.G.S. 7.5 minute series topographic map of Pocasset, MA.

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Figure 2-1
Site Location Map
TDS J-3 Range
Greenway Road
Otis Air Force Base
Sandwich, MA

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There are currently four above ground storage tanks on the J-3 Range. These tanks are located at buildings J-3-1, J-3-3, J-3-6 and J-3-7. The tanks at J-3-3, J-3-6, and J-3-7 were installed in March 1991, at which time a secondary containment area was constructed around the above ground tank already in place in building J-3-1. All four tanks are used for heating oil for the building boilers. The tanks in building J-3-3, J-3-6 and J-3-7 were installed in preparation for the removal of the three underground oil storage tanks then in place at those same buildings. The USTs were removed on June 19, 1991 by Northeast Tank Services, and according to the records reviewed, no evidence of contamination was found. The removed tanks included a 500 gallon steel tank at building J-3-7; a 1,000 gallon fiberglass Owens-Corning tank at building J-3-6; and a 1,000 gallon steel tank at building J-3-3. It was noted in the summary memorandum dated June 20, 1991, that the plans showed a 500 gallon rather than a 1,000 gallon tank at building J-3-6. One soil sample was taken from each of the tank excavations and analyzed for total petroleum hydrocarbons (TPH). The results of the analysis indicated that TPH was not present in the samples above the method detection limit. In addition to these soil samples, head space readings were conducted by Textron personnel during the tank removal in order to determine if a release to the environment had occurred. According to the records reviewed, no reading above 10 parts per million were detected. See Appendix B for Tank Installation and Removal Documentation.

The J-3-4 and J-3-9 buildings are heated by electricity.

2.3 Historical Land Use

Camp Edwards, of which the J-3 Range is a part, was established in 1935 by the Commonwealth of Massachusetts for the purpose of National Guard Army Reserve training. According to the information reviewed, the majority of the activities have occurred within the cantonment area located approximately 1.75 miles south of the J-3 Range. The J-3 Range has been used by Textron Cape Operations for the testing of warheads and similar procedures since 1968. Prior to that time the J-3 Range was largely undeveloped, containing only a dirt access road and a latrine. The J-3 Range appears to have been part of the training area at that time.

2.4 Physiography/Surface Hydrology

The surface hydrology of the site has the same general characteristics as that of the MMR and the Cape as a whole. The surface hydrology of the MMR does not exhibit the typical drainage basin system, rather it consists of kettle hole topography and drainage. Kettle holes are the depressions left by the melting of an ice block deposited during a glacial retreat. These kettle holes contain water when they intersect the water table, and act as recharge points for groundwater. The small kettle holes on the MMR have been classified B waters by DEP; designated for the uses of protection and propagation of fish, other aquatic life and wildlife; and for secondary recreation (MMR report, October 1991, p 3.10-6).

A visual inspection of the J-3 Range did not identify any on-site surface water bodies.

2.5 Soils, Geology and Hydrogeology

The soil, geology and hydrogeology of Cape Cod is fairly uniform due to its formation by glacial deposition. The groundwater of Cape Cod is contained in a single (sole source) aquifer comprised mainly of sand and gravel deposits, beneath which finer grained deposits of sand and silt occur. According to a hydrogeologic summary produced in 1989, the aquifer in the vicinity of the MMR has a maximum thickness of 270 feet and is underlain by cystalline bedrock. The groundwater is reported to be more than 10 feet below the ground surface in most of the MMR area, with production yields of up to 2,000 gallons per minute in outwash deposits (MMR Report, October 1991, p 3.10-6). Based on a review of the Barnstable County Soil Survey (March 1993) the J-3 Range is located in an outwash plain. The MMR Report (October 1991) and a review of topographic data indicate that groundwater from the J-3 Range is likely to occur between 15 and 25 feet below the ground surface; with a groundwater flow in an southeasterly direction, toward Snake Pond. According to information obtained from the Sandwich Planning & Development Office, the J-3 Range is in the Zone Of Contribution (ZOC) of the Weeks Pond Wellfield Well Number 5, located south of Snake Pond; and the ZOC of the Pinkham Road Wellfield Well Numbers 4 & 6, approximately 2.6 miles to the east of the J-3 Range. Appendix C provides supporting documentation regarding soil, geology and hydrology of the area, as well as a figure showing the ZOC areas relative to the site.

2.6 Climate

The climate of the subject site, as that of the entire area, is expected to be significantly influenced by the moderating effects of the ocean. The average monthly precipitation at the MMR, as recorded over a 28 year period at Otis Air Force Base, ranges from a normal low of 2.0 inches to 3.3 inches in June and July, to a high of 4.8 inches in January and August (MMR Report, Oct. 1991, p 3.2-1).

Cape Cod's average daily temperature is approximately 50 degrees Fahrenheit (F.), with an average daily temperature range of 13 - 16 degrees F. recorded for the MMR. The average temperature on the MMR during the coldest months (January and February) is reported to be 30 to 31 degrees F., and that of the warmest month (July) is 71 degrees F. (MMR Report, Oct. 1991, p 3.2-1).

The prevailing wind direction at the MMR, and presumably at the J-3 Range, varies with season. From November to March the prevailing winds are from the northwest, with a transition to southwest prevailing winds occurring between March and May. The southwest winds then prevail throughout the summer, with another transitional period occurring in November (MMR Report, Oct. 1991, P 3.2-3).

According to the MMR report, thunderstorms occur an average of 14 days per year in the vicinity of the MMR. Most of these thunderstorms (a few of which are accompanied by hail) occur in the summer months (MMR Report, Oct 1991, p 3.2-5).

2.7 Noise

In evaluating the noise level and Installation Compatible Use Zones (ICUZ) for the MMR, the Army defined three noise zones which are used in determining acceptable land uses. These zones, referred to as Zones I, II and III are measured for both impulsive noise (C-weighted) or continuous noise (A-weighted). These zones are defined in terms of their proximity to noise sensitive land uses, including housing, schools and medical facilities. Noise sensitive land uses would be acceptable in Zone I, normally unacceptable in Zone II, and completely unacceptable in Zone III. According to the information provided in the MMR report (Maps 19 and 20), the J-3 Range is in Zone I for impulsive noise and at the edge of the Zone II delineation for continuous noise (MMR Report, Oct 1991, p 3.4-9). Copies of the ICUZ maps (19 and 20) are provided in Appendix D.

3.0 RESULTS OF ON-SITE INVESTIGATION

3.1 Contaminated Structures, Buildings or Fixtures

A visual inspection of the J-3 Range was conducted by ENSR personnel on Friday, November 19, 1993. The results of this inspection indicated only minor staining noted on the concrete floors around the boilers in buildings J-3-3, and J-3-6 (See Figure 2-2 for building locations). Staining around boilers such as this is common and is usually due to boiler blowdown water and possible loose fittings. The stained area in building J-3-3 was approximately 6 ft x 6 ft, and appeared to be due to water staining. The stained area in J-3-6 was approximately 3 ft x 4 ft, and was rust colored in some areas, indicating again that it was from boiler blowdown water.

3.2 Unexploded Ordnance

According to facility personnel there is no unexploded ordnance on the J-3 Range. The warheads that are tested at the facility do not contain explosives. The only explosives reportedly used on-site are those used for launching the warheads.

3.3 Raw Material Storage Areas (including above and underground storage tanks, chemical storage areas, etc...)

The raw material storage areas include several storage sheds for miscellaneous fittings and electrical equipment, the munitions bunkers, a gasoline storage shed, a paint storage shed and the four above ground tanks located within buildings J-3-1, J-3-3, J-3-6 and J-3-7. All of the storage sheds, paint shed, and munitions bunkers were in good condition at the time of the site inspection. It was noted during the inspection of the gasoline storage shed (building J-3-C-1) that the drip tray beneath the two flammable storage lockers contained a significant amount of water.. According to site personnel this is due to the fact that rainwater can enter the sheet metal building. Outside the gasoline storage shed there was a cradle with one tapped 55-gallon drum of virgin diesel fuel. This drum was not labeled and there was no drip pan or other device beneath it to prevent a release to the ground surface. However, no significant staining was noted beneath this drum at the time of the inspection, and Textron personnel indicated that the situation was in the process of being rectified.

An inspection of the four above ground fuel oil storage tanks revealed that they were all in good condition. No staining was noted around the tanks in J-3-1, J-3-3 or J-3-6. A small

amount of oil residue was noted within the containment area for the above ground fuel oil storage tank in building J-3-7. The containment area is made of wood with a sheet metal liner. No oil stains were present outside the containment area and the tank appeared in good condition.

3.4 Non-Regulated and Hazardous Waste Storage Areas

The only non-regulated and hazardous wastes generated at the facility are produced in the photo-development process. These chemical wastes consist of Kodak Fixer, Kodak Developer, and an acetic acid stop bath. The fixer and developer are considered non-regulated wastes, and the acetic acid stop bath is a hazardous waste. These wastes are used in the photo-developing equipment in building J-3-6. When the chemicals are finished being used they are transferred to 30 gallon plastic drums which are stored in the photo-development room. This room has a cement floor and there were no signs of leaks or spills; however, there is a floor drain in the room which reportedly discharges to the on-site septic system. As mentioned in section 2.2, the facility is considered a very small quantity generator of hazardous waste. Given this designation Textron is able to transport these wastes off-site to their Wilmington Facility. The wastes are then manifested out with the Wilmington Facility's wastes, to Laidlaw Environmental Services, 300 Canal Street, Lawrence, Massachusetts (See Appendix A for copies of waste manifests).

3.5 Environmental Compliance

The results of the inspection of the facility indicate that Textron Cape Operations is currently in compliance with the applicable state and federal environmental regulations. It should be noted however, that this inspection did not constitute a comprehensive environmental compliance audit. Based on a site visit and review of records available from Textron, the current operations at the J-3 Range do not require any air or water discharge permits.

According to Textron personnel a site walk over of the facility was conducted by the U.S. Environmental Protection Agency (EPA) and Massachusetts Department of Environmental Protection (DEP) in the fall of 1992. This inspection was in conjunction with an investigation of groundwater contamination that was/is impacting the Air National Guard (ANG) property in the area of the J-3 Range. Textron contacted the ANG after this inspection and they indicated that the agencies (EPA and DEP) had found no evidence of contamination resulting from operations on the J-3 Range.

4.0 EVALUATION OF ECOLOGICAL BASELINE

4.1 Forests and Woodlands

Based on observations made during the site visit, approximately 30% of the J-3 Range consists of undeveloped woodlands. The majority of the woodland is located at the southeast end of the property, near Greenway Road. Stands of trees also exist between buildings, and around the perimeter of the testing area. The woodlands, as is characteristic for Cape Cod, consist primarily of conifers including pitch pine, jack pine, and some oak. These woodlands were generally of medium density, with an undergrowth of grasses and various low bushes . The MMR Report map 12 concurred with these findings, indicating that the center of the site was open grassland; with the southeast end and perimeter consisting of "mixed scrub" and coniferous forest (See Appendix E for copy of Map 12). An in depth study of on-site vegetation was outside the scope of this investigation.

4.2 Fish and Wildlife Populations and Habitat

No fish populations or habitats exist on the J-3 Range. The nearest water body is Snake Pond, approximately 2,500 feet south of the site.

The MMR as a whole consists of approximately 80% pitch pine/scrub oak forest and offers a variety of habitats for wildlife. The MMR provides a wildlife corridor from the Shawmee-Crowell State Forest, to the north of the MMR, to the Crane wildlife Management Area to the south of the MMR. A wildlife study specifically for the J-3 Range was not conducted as part of this investigation. The mammals that can be found on the MMR include red fox, gray fox, red squirrel, eastern chipmunk, cottontail rabbit, shorttail weasel and white tail deer. The MMR also provides a varied habitat for birds including ruffed grouse and bobwhite quail, herring gull, chickadee, goldfinch, osprey, red tailed hawk, blue jay, mockingbird, brown thrasher and american robin. Although there are a number of amphibian species on the MMR, including various frogs, snakes and turtles, the occurrence of these animals on the J-3 Range is expected to be limited by the lack of surface water on or adjacent to the property. (Information based on MMR Report, October 1991, p 3.6-16 & 17).

No wildlife was noted on the J-3 Range at the time of the site inspection.

4.3 Threatened or Endangered Species

According to the information provided in the MMR Report, there are no known threatened or endangered species (flora or fauna) on the J-3 Range. The closest rare or endangered species noted in the report was Sandplain Flax, a state listed plant species of special concern. The Sandplain flax was identified in a grassy roadside area along Greenway Road, approximately 1.25 miles southwest of the subject site. Also noted at that location were Little Lady Tresses and Nuttail's Milkwort which are on the Massachusetts Watch List (formerly considered rare) (MMR Report, Oct 1991, p 3.6-16 and Map 15). A copy of the Wildlife & Flora map (map 15) is included in Appendix E.

4.4 Soils and Vegetation

The J-3 Range area is part of the Enfield-Merrimac-Carver soil formation and consists of nearly level to steep, very deep, excessively drained and well drained, loamy and sandy soils formed in glacial outwash and eolian material, in glacial outwash sediments and glacial till; in areas of glacial lake deposits (US Department of Agriculture Soil Conservation Service/Mass. Experiment Station, General Soil Map for Barnstable County, Massachusetts, March 1993). See Appendix C for excerpts from the soil survey. Based on visual observations, the J-3 Range appears to consist primarily of well drained sandy soils of varying slope.

The vegetation on the J-3 Range consists primarily of mixed pine and oak, open to medium density, woodlands. The undergrowth and vegetation in the open areas of the site consists of various grasses (See Vegetation Type & Density Map (MMR Report, map no. 12) in Appendix E).

4.5 Nature of Ecosystem (i.e. prime or unique farmland, native prairies or grasslands)

Based on observations during the site visit, review of the MMR Report, and a review of the Soil Survey for Barnstable County (March 1993), the J-3 Range is not located on prime or unique farmland; nor is the area considered a native prairie or grassland (the table of Prime Farmland and Soils, from the Barnstable County Soil Survey, are provided in Appendix C).

4.6 **Surface Water, Wetlands and Flood Plains** (presence and condition on-site)

The site inspection and review of available data did not indicate the presence of any surface water bodies, or wetlands on the J-3 Range. Although according to the Flood Insurance Rate Map (FIRM) for Sandwich, Massachusetts (August 5, 1991), the flood hazard of the area of the J-3 Rage has not been determined, the area immediately abutting the site is outside the 500 year floodplain. Therefore, it is reasonable to assume the J-3 Range is also outside the 500 year flood plain.

4.7 Groundwater Supplies and Quality

According to a map of the Water Resource Districts for the Town of Sandwich, Massachusetts, obtained at the Sandwich Engineering Office, the J-3 Range is within the zone of contribution (ZOC) for the Weeks Pond Wellfield Well Number 5, located south of Snake Pond; and the ZOC of the Pinkham Road Wellfield Well Numbers 4 & 6, approximately 2.6 miles to the east of the J-3 Range (See Figure C-3: ZOC in Appendix C). As noted earlier, all of Cape Cod is underlain by a sole source aquifer. The information reviewed indicated that this aquifer is generally of good chemical quality for drinking and other uses. The groundwater is typically "low in dissolved solids, is soft and virtually free of toxic heavy metals and organic compounds."(MMR Report, October 1991, p 3.10-8).

There are two process/sanitary use water supply wells on the J-3 Range, one located at building J-3-1 and the other at building J-3-6. Sample results from 1988, 1990 and 1992 were reviewed as part of this investigation. Samples from both wells were analyzed for trace metals, volatile organic compounds (VOC), and bacteriological and chemical analysis (See Appendix E for a copy of analytical results). The metal analysis results from both wells indicate that the only metals present in detectable concentrations are fluoride and copper. The fluoride concentrations in well J-3-1 were measured in 1988 and 1990 at 0.20 mg/L and 0.24 mg/L, respectively. The concentrations of fluoride in the J-3-6 well similar and ranged from 0.15 mg/L in 1988 to 0.27 mg/L in July 1992. Copper concentrations in Well J-3-1 were 0.208 mg/L and 0.21 mg/L in 1988 and 1990, respectively; while concentrations in Well J-3-6 ranged from 0.63 mg/L in 1988 to 2.35 mg/L in 1992. No standards exist with which to compare these results.

The volatile organic compound analysis on water samples from the two wells detected benzene in both wells in 1988, with concentrations of 0.93 ug/L (ppb) in Well J-3-1 and 0.56 ug/L in J-3-6. No VOCs were detected in the 1990 or 1992 samples.

It was noted in the process of conducting this investigation that there is a groundwater monitoring well along Greenway Road, near the entrance to the J-3 Range. This monitoring well is part of an on-going investigation of groundwater contamination resulting from off-site sources. No detailed information regarding this investigation was available in the course of this investigation.

4.8 Outdoor Recreational Resources

No outdoor recreational resources were observed on-site during the course of this investigation. Furthermore, the closest potential outdoor recreational resource is Snake Pond located approximately 2,500 feet south of the J-3 Range.

4.9 Cultural and Historical Resources

Cultural resources can be broadly defined to include any site, structure, or object which possesses state, local, or national importance due to its association with historical events or persons, embodies distinctive characteristics of a type, period, or method of construction, or which has yielded, or is likely to yield information important to history, prehistory, or paleontology (MMR Report, Oct, 1991, p 3.11-1).

Given the current use of the J-3 Range, its prior use as part of the Camp Edwards training area and the lack of permanent structures on the property, it can be inferred that no historical sites are present on the subject property.

Studies of cultural, archeological and historic resources were conducted on the MMR for Massachusetts Army National Guard and Otis Air Force Base, in 1986. The J-3 Range was not included in these studies, but some inferences can be made. The studies indicated that there are no historically-significant structures within the bounds of the training area (MMR Report, Oct 1991, p 3.11-4). The archeological studies indicated that there are several locations on the MMR that are considered to have high sensitivity (high potential for archeological information); but that overall, a significant percentage of the training area was considered to have low archeological potential (MMR Report, Oct 1991, p 3.11-6).

5.0 SURROUNDING LAND USE AND SENSITIVE RECEPTORS

5.1 Current Surrounding Land Use

The J-3 Range is located within Camp Edwards, and is surrounded by undeveloped forestland to the north, east and west. To the south of the site is Greenway Road, across which is more undeveloped woodland. Between Greenway Road and Route 130, approximately 1/2 mile east/southeast of the site, is the property boundary for Camp Edwards. The area between Camp Edwards and Route 130 (part of the Town of Sandwich) is zoned Low Density Residential (R-2) and currently contains approximately 110 homes (See Figure F-1, Appendix F, Surround Land Use Zoning). The area to the north of the site is a designated impact area for Camp Edwards, and is used by the Massachusetts Army National Guard for training in artillery use.

5.2 Existing and Potential Human Populations in Area

The on-site population consists of one permanent full time employee, with the number of temporary personnel (from the Wilmington Facility) varying from 1 to 30 depending on the testing procedures being undertaken. According to Textron personnel, the number of employees at the J-3 Range is not expected to change in the foreseeable future.

The population of the property abutting the J-3 Range is currently zero, as the land is undeveloped. The potential population of this area is dependant upon future Army uses, and could not be determined with the available information.

The closest resident population is the residential area along State Route 130, in Sandwich, Massachusetts, between 1/2 mile and one mile east/southeast of the site. The population of this area is estimated to be 385 (approximately 110 homes multiplied by 3.5 people per home). According to Ms. Marie Blaney of the Sandwich Planning Department, further development of this area has been halted for the foreseeable future. Therefore, the population of the area should not change significantly.

Given the noise evaluation in the MMR Report, as discussed in Section 2.7, and the continuation of current site uses, the on-site activities are not expected to adversely impact the human populations in the area (See Appendix D for copies of the ICUZ maps (19 &20) from the MMR Report).

5.3 Proximity to a Pubic Planning District

Based on conversations with Marie Blaney of the Sandwich Planning Board and Dorr Fox of the Cape Cod Commission, the J-3 Range does not fall within any public planning areas. The closest potential planning area (an area of proposed growth) in the Town of Sandwich is located approximately four miles northeast of the subject site, near the junction of Routes 6 and 130 (See Appendix G for documentation).

5.4 Inclusion in or Proximity to a National Wilderness Area

The National Park Service, National Forest Service and Department of Fish and Wildlife were contacted in an effort to determine the proximity of the site to any national wilderness areas. According to Ms. Gina Johnson of the National Park Service, there are no national parks near Sandwich, Massachusetts. The closest National Wildlife Refuge, according to Mr. Andrew Devitt or the U.S. Fish and Wildlife Service, is Massoit National Wildlife Refuge near Myles Standish State Forest across the Cape Cod Canal, in Plymouth County. This refuge is more than 12 miles northwest of the J-3 Range (See Appendix G for Documentation of National Park and Wildlife Refuges).

Given the distance of these areas from the J-3 Range, it is unlikely that the on-site activities would have any adverse environmental impacts.

5.5 Other Army or non-Army Jurisdictional Limitations on Property Use

No other areas of jurisdictional limitation on land use were determined to be present in the vicinity of the J-3 Range. It is our understanding that this determination will be made by Army personnel while reviewing this report.

6.0 AREAS OF POTENTIAL ENVIRONMENTAL CONCERN

6.1 Description and Evidence of Impact

Two areas of potential environmental concern were identified during the site inspection. The first potential area of concern was the floor drain located in the photo-developing room in building J-3-6. According to Textron personnel this drain is connected to the on-site septic system. Although this drain would be impacted if a chemical release occurred, there were no stains around the drain to suggest that such a release has occurred.

The second area of potential environmental concern was the drum of diesel fuel located outside the gasoline storage shed (J-3-C-1). This drum was sitting on a wooden cradle on the ground surface, with no barrier or containment mechanism to protect against an accidental release to the ground surface. A visual inspection of the ground surface did not reveal any soil staining, nor was any other evidence of a significant release observed at the time of the site inspection.

6.2 Exposure Assessment (potential of exposing existing or future human populations to an adverse environmental Impact)

The potential of exposing existing or future human populations to adverse environmental impacts was evaluated based on the results of a visual inspection of the J-3 Range and a review of available data regarding the current environmental conditions. This evaluation indicated that the current operations, waste handling and environmental conditions pose little to no potential for such exposure.

7.0 SUMMARY OF FINDINGS AND CONCLUSIONS

7.1 Summary of Findings & Recommendations

The potential sources of contamination identified on the J-3 Range include the four above ground fuel oil storage tanks at buildings J-3-1, J-3-3, J-3-6 and J-3-7; the use and storage of photo-developing chemical; the floor drain in the photo-development room in building J-3-6; and the drum of diesel fuel located outside the gasoline storage shed (J-3-C-1). The potential for contamination arising out of the presence of the above ground fuel oil tanks and the use and storage of photo-development chemicals, has been minimized through proper storage, handling and disposal practices implemented by Textron. The four above ground tanks are all equipped with the proper secondary containment and appeared in good condition at the time of the inspection. The photo-development chemicals are handled and disposed of in accordance with the appropriate regulations for very small quantity generators.

The only remaining issues of potential concern are the floor drain in the photo-development room (building J-3-6); and the drum of diesel fuel outside the gasoline storage building (J-3-C-1). Although both of these areas have the potential to adversely impact the environment, there was no evidence (i.e. staining) to suggest that there has been an impact to date.

Based on the findings of this environmental survey, ENSR recommends the following precautionary measures be taken to limit the potential adverse environmental impact from on-site operations:

- The floor drain in the photo-development room in building J-3-6 should be sealed to prevent a release of chemicals to the on-site septic system; and,
- The drum of diesel fuel should be relocated and equipped with an appropriate containment device in order to avoid a release to the ground surface.

No other areas of potential environmental concern were identified in the course of this environmental survey.

7.2 Conclusions

The continuation of current handling and disposal practices for explosives, detonators and photographic chemicals, will limit the potential for any adverse environmental impacts from

site operations. This environmental survey has identified little or no potential for environmental contamination or disruption from past, present, or proposed activities.

8.0 STUDY LIMITATIONS

This Report and all field data, notes, and laboratory test data (where applicable) were gathered and/or prepared by ENSR in accordance with the agreed upon scope of work and generally accepted engineering and scientific practices in effect at the time of ENSR's investigation of the site.

The statements, conclusions, and opinions contained in this Report are only intended to give approximations of the environmental condition of the site limited to the particular environmental issues actually targeted by ENSR's investigation as described in our proposal dated October 4, 1993.

This Report and all supporting field data, notes and laboratory test data where applicable (collectively referred to hereinafter as "information") were prepared or collected by ENSR Consulting and Engineering for its client, Textron Defense Systems. ENSR's client may release the information to third parties, who may use and rely upon the information at their discretion. However, any use of or reliance upon the information by a party other than specifically named above shall be solely at the risk of such third party and without legal recourse against ENSR, its parent company, or its subsidiaries and affiliates, or their respective employees, officers or directors, regardless of whether the action in which recovery of damages is sought is based upon contract, tort (including the sole, concurrent or other negligence and strict liability of ENSR), statue or otherwise. This information shall not be used or relied upon by a party that does not agree to be bound by the above statement.

APPENDIX A

HAZARDOUS WASTE GENERATOR DOCUMENTATION

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
Department of Environmental Quality Engineering
Division of Hazardous Waste
One Winter Street, Boston, Mass. 02108

Daniel S. Greenbaum
Commissioner

DEQE
NOW IS
THE DEPARTMENT OF
ENVIRONMENTAL PROTECTION

Re: DEP Number

M.A.V.0.0.0.0. .1.2.1.1.2

Dear Owner/Operator:

This letter is to confirm that your place of business has been issued a Department of Environmental Protection (DEP) Number for use on hazardous waste manifests and other documents related to your hazardous waste activity.

Enter this number on your Registration Form on the line beginning with the letters M.A.__.__.__.__.__.__.__.__.__ and keep the beige copy for your records. This number is valid only for hazardous waste shipped from this address:

Textron Cape Operations
Camp Edwards
Cape Cod MA 02563

To qualify for this number, you must generate no more than 27 gallons a month of hazardous waste and/or no more than 270 gallons a month of waste oil. If you generate more than these amounts on a regular basis, you must apply for a permanent EPA Identification Number and should not complete the enclosed Generator Registration Form. You can obtain an application for the EPA number by calling us at 1-800-343-3420.

If you have any questions, please call our compliance assistance line (617) 292-5898 between 9:00 a.m. and 1:00 p.m.

Very truly yours,

Compliance & Enforcement Branch

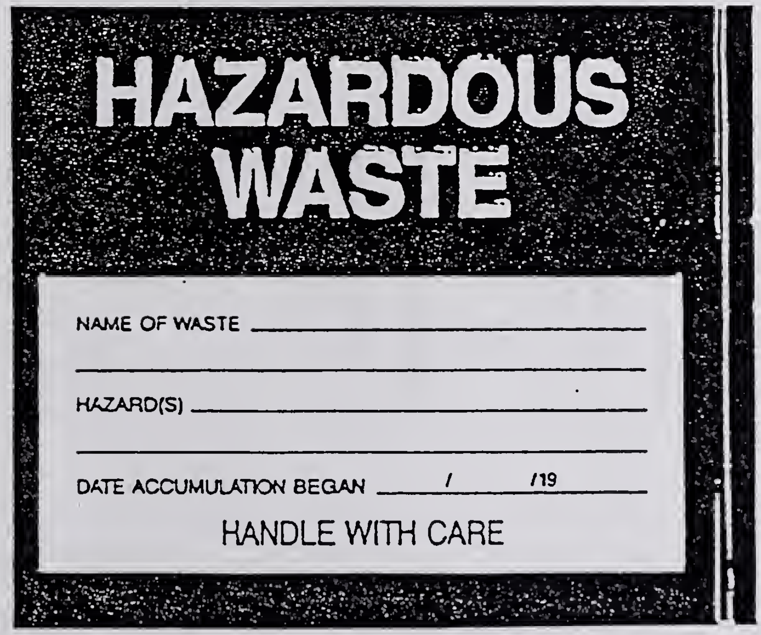
LABELING HAZARDOUS WASTE IN STORAGE
[310 CMR 30.340(1)(b)]

According to Massachusetts Hazardous Waste Management Regulations, each container and tank containing hazardous waste must be labeled. You may make your own like the sample below, or purchase labels from:

Certified Business Forms
217 California Street
Newton, MA 02158

(617) 969-0550
Attention: John Pastuszak

Quantity	Cost
25	$ 14.62
50	22.62
100	40.73
150	56.74
200	70.65
300	92.17
400	108.44
500	122.61



HAZARDOUS WASTE

NAME OF WASTE ______________________

____

HAZARD(S) ______________________

____

DATE ACCUMULATION BEGAN ____/____/19____

HANDLE WITH CARE

Prepared by the Industry Outreach Program, Division of Hazardous Waste (DEP) 7/89

RULES FOR MASSACHUSETTS VERY SMALL QUANTITY GENERATORS

If you are a Very Small Quantity Generator of Hazardous Waste or Waste Oil
you may Self-Transport your Waste According to the Following Rules:

- Transport Only Your Own Waste
- DO NOT Transport Acutely Hazardous Waste
- Transport No More Than 55 Gallons a Trip
- Label Your Containers Properly:

Hazardous Waste
Type of Waste:
Type of Hazard:

- Seal Container Tightly & Secure to Vehicle
- Keep a Copy of Your VSQG Registration In Your Vehicle
- Obtain a Receipt for Your Waste
- Keep Your Receipts for 3 Years

IN CASE OF A SPILL, FIRE OR LEAK DURING TRANSPORT, CALL:

The DEP Regional Office In Your Area:

Metro Boston	(617) 935-2160
Worcester	(508) 792-7653
Springfield	(413) 784-1100
Lakeville	(508) 946-2817

After 5:00 pm:

MA State Police	(617) 566-4500

Return White Copy of this Form to:

VSQG Registration
DEP Hazardous Waste
1 Winter St.
Boston, MA 02108

Questions? Call DEP at (617) 292-5898

Registration Valid Until January 1, 1991

KEEP BEIGE COPY FOR YOUR FILES

TEXTRON Defense Systems
ron Defense Systems/ Subsidiary of Textron Inc.
well Street, Wilmington, MA 01887

INTEROFFICE MEMORANDUM

TO	R. Stephens
DATE	January 18, 1991 B220-RJL-002-091
FROM	R. Longo
SUBJECT	Hazardous Wastes Generated At J-3 Range.
PY TO	R. Bellaire, R. Clark, J. Farino, J. Pinciaro, J. Tanin, M. Tremblay, File.

Attached, please find an updated Very Small Quantity Generator Self Transport Receipt, as required by the Massachusetts Department of Environmental Protection (DEP), for the hazardous wastes being generated at and transported from TEXTRON Cape Operations J-3 Range. On the reverse side of this receipt is the registration copy and the rules for VSQGs which must be complied with at all times.

The completion of this receipt will be as in the past, J-3 personnel are to complete the top portion of this form for each shipment of listed materials to TDS. Once received at TDS and shipped as hazardous waste, Environmental Engineering personnel will complete the receipt and forward a copy to Mr. Clark as noted, who must at that point retain these copies on file for a period of no less than three years

This system has worked well in the past, and I see no reason for changes at this time, so long as all personnel involved are properly informed as to what the requirements for this operation are.

Should you have any questions regarding this matter, or require further clarification, please contact me at extension 3782.

Rudolph J. Longo Jr.
Environmental Coordinator

MMR BLDG. 6

MOVE TICKET

QUANTITY	UNIT	PART NUMBER AND/OR DESCRIPTION	SECURITY CLASSIFICATION
		HAZARDOUS WASTE CHEMICALS	
			UNC
10	GAL.	KODAK DEVELOPER GBX-DILUTED/WATER	↑
10	GAL.	KODAK FIXER (FIXER RAPID) DILUTED/WATER	|
5	GAL.	KODAK ACETIC ACID (STOPBATH) DILUTED/WATER	↓
			UNC
		ATTN: ENVIRONMENTAL ENG.	

MOVE FROM TCO CAMP EDWARDS MA.	TO TDS WILMINGTON MA.	DATE 3/25/93	TEL. EXT	TRAVELLER NO./R.R. NO
REQUESTED BY R. CLARK	DEPARTMENT NAME AND NO TCO 1241	DATE 3/25/93	TEL. EXT.	NEXT ASSEMBLY NO.
RECEIVED BY	DEPARTMENT NAME AND NO	DATE	TEL. EXT	PART NO

INSPECTION	WORK ORDER NO.	STORES REC POSTED	SHIPPING ORDER REQUEST NO	SMO NO.	OTHER

FILE COPY

MULLEN PRINTING CO., INC., SPRINGFIELD, MASS.

89702

TEXTRON Defense Systems

Textron Defense Systems/
Subsidiary of Textron, Inc.

201 Lowell Street
Wilmington, MA 01887

VERY SMALL QUANTITY GENERATOR
SELF TRANSPORT RECEIPT

Type And Quantity Of Waste (Not To Exceed 55 Gal.) 25 GAL-HAZARDOUS CHEMICAL WASTE

Name And Dept. Of Person Transporting Waste. R CLARK 1241 TCO

Area Supervisors Signature. Robert M. Clark Date 25 MARCH 93

(Lower Portion To Be Completed By TDS Environmental Representative Only)

Date Waste Received 3/30/93

Signature Michael [illegible] Date Shipped For Disposal 5/20/93

Comments And/Or Problems 10 GAL KODAK DEVELOPER GBX - 10 GAL KODAK FIXER (FIXER RAPID) - 5 GAL KODAK ACETIC ACID (STOP BATH) ALL OF THE CHEMICALS ARE DILUTED WITH WATER.

NOTE: Upon completion of this receipt, a copy is to be mailed to the designated representative of the J-3 Range, at the below listed address:

TEXTRON Cape Operations, J-3 Range
Camp Edwards, MA 02542

(See Reverse For D.E.Q.E. Registration)

DIVISION OF HAZARDOUS WASTE
One Winter Street

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street
Boston, Massachusetts 02108

[illegible] print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator US EPA ID No. MAD00[illegible] Manifest Document No. [illegible]	2. Page 1 of [illegible]	Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
[illegible] Defense Systems
201 Lowell Street
[illegible]ington, MA [illegible]
Attn: [illegible]

4. Generator's Phone ([illegible]08) 657-1101

5. Transporter 1 Company Name [illegible] Environmental Service [illegible] Northeast Inc
6. US EPA ID Number [illegible]

7. Transporter 2 Company Name
8. US EPA ID Number

9. Designated Facility Name and Site Address
[illegible] Environmental Services (Northeast) Inc.
[illegible] Canal Street
[illegible]
10. US EPA ID Number M[illegible]47

A. State Manifest Document Number MA[illegible]6343
B. State Gen. ID [illegible]
C. State Trans. ID MA[illegible]
D. Transporter's Phone [illegible]
E. State Trans. ID [illegible]
F. Transporter's Phone [illegible]
G. State Facility's ID [illegible] Not Required
H. Facility's Phone [illegible]

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. Waste Resin Solid [illegible] 2	[illegible]	[illegible]	15	G	[illegible]
b. Non-Regulated Material	[illegible]	DF	15	G	[illegible]
c. Non-Regulated Material	[illegible]	DF	15	G	[illegible]
d. [illegible] Waste Flammable Liquids, N.O.S. [illegible] (Methyl Ethyl Ketone, Kerosine) [illegible] (D001) (F005) [illegible]	001	DF	00005	G	[illegible]

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code) [illegible]
K. Handling Codes for Wastes Listed Above [illegible]

15. Special Handling Instructions and Additional Information [illegible] Laidlaw Environmental Services (NorthEast) Inc. are [illegible] NOTE: [illegible] 15 gallons [illegible]

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name [illegible] | Signature | Date Month Day Year [illegible]

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name [illegible] | Signature | Date Month Day Year [illegible]

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Date Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name | Signature | Date Month Day Year

MA F286343 COPY>8: GENERATOR RETAINS

AIDLAW
NVIRONMENTAL
VICES

stomer Notification And Certification

tements with Original Signatures will be Accepted!

75387
4950 TEXTRON DEFENSE SYSTEMS
201 LOWELL ST.
WILMINGTON MA 01887

r Name/Location: MAD001063943
I.D. Number: [illegible]
ofile or ARF Designation: MAF286338 THRU 344
Number: [illegible]
azardous Waste Number(s):
alysis Attached? YES ______ NO ______ On file at facility. [illegible]

cted Waste Notification (Category 1)

notify that I am familiar with the waste through analysis and testing or through knowledge of the waste to support this notification that the waste is not restricted as specified in 40 CFR 268, Subpart D and all applicable prohibitions set forth in 40 CFR 268.32 or RCRA Section 3004(d).

d Waste Notification (Category 2)

a) I notify that I am familiar with the waste through analysis and testing or through knowledge of the waste to support this notification that the waste is subject to the treatment standards specified in 40 CFR 268, Subpart D. Waste must be treated to the appropriate regulatory treatment ndard, by the appropriate regulatory treatment method, or qualifies for a variance as described in Category 3; or meets the standard as described der Category 4.

** SEE DETAIL PAGE(S) **

)For hazardous debris, the waste contains the following contaminants subject to treatment (check all that apply): ___§ 268.45(b)(1)-Toxicity racteristic debris; ___§ 268.45(b)(2)-Debris contaminated with listed waste; ___§ 268.45(b)(3)-Cyanide reactive debris. This hazardous debris is ject to the alternative treatment standards of 40 CFR 268.45.

nding Treatment Standard(s) ______

ory 3 - Variance Notification

Restricted Waste Variance Notification

tify pursuant to 40 CFR 268.7(a)(3) that I am familiar with the waste through analysis and testing or through knowledge of the waste to support notification that this waste is subject to a national capacity variance under 40 CFR 268 Subpart C, or a case-by-case extension under 40 CFR 268.5, or an exemption under 40 CFR 268.6.

licable Variance (Give the date the waste is subject to prohibitions) ______

Hazardous Debris Extension Notification

he hazardous debris waste stream accompanying this notification, I notify that I have made the necessary submittals to my operating record, or les maintained pursuant to 40 CFR 268.7(a)(5), as described in the May 15, 1992 Federal Register (57 FR 20769), and therefore this hazardous debris shipment qualifies for the one-year generic case-by-case extension.

cable Variance (Give the date the waste is subject to prohibitions) ______

Waste Certification (Category 4)

ify under penalty of law that I personally examined and am familiar with the waste through analysis and testing or through knowledge of the e to support this certification that the waste complies with the treatment standards specified in 40 CFR Part 268 Subpart D and all applicable rohibitions set forth in 40 CFR 268.32 or RCRA Section 3004(d). I believe that the information I submitted is true, accurate, and complete. I am that there are significant penalties for submitting a false certification including the possibility of fine and imprisonment.

Lab Pack Certification

a) Organometallic (inorganic)

ify under penalty of law that I personally have examined and am familiar with the waste and that the lab pack contains only the wastes specified pendix IV to Part 268 or solid wastes not subject to regulation under 40 CFR Part 261. I am aware that there are significant penalties for itting a false certification, including the possibility of fine or imprisonment.

tification of Corresponding Treatment Standard: Incineration followed by stabilization of residues to demonstrate compliance with 40 CFR 2(c). (INCIN fb STABL)

rganic

ertify under penalty of law that I personally have examined and am familiar with the waste through analysis and testing or through knowledge of ste and that the lab pack contains only organic waste specified in Appendix V to Part 268 or solid wastes not subject to regulation under 40 art 261. I am aware that there are significant penalties for submitting a false certification, including the possibility of fine or imprisonment.

cation of Corresponding Treatment Standard: Incineration (INCIN)

TURE: Michael Trembley DATE: 5/20/93
NAME: MICHAEL TREMBLAY TITLE: ENVIRONMENTAL tech

BLDG.: BLDG. 6

MOVE TICKET

82712

QUANTITY	UNIT	PART NUMBER AND/OR DESCRIPTION	SECURITY CLASSIFICATION
		HAZARDOUS WASTE CHEMICALS	
			UNC
10	GAL	KODAK DEVELOPER GBX-DILUTED/WATER	
10	GAL	KODAK FIXER (FIXER, RAPID)-DILUTED/WATER	
5	GAL	KODAK ACETIC ACID (STOP BATH)-DILUTED/WATER	
			UNC
		ATTN: R. LONGO-ENVIRONMENTAL ENG.	

RECIPIENT

MOVE FROM TCO CAMP EDWARDS MA.	TO T28 WILMINGTON MA.	DATE 1/28/93	TEL. EXT	TRAVELER NO./R.R. NO.
REQUESTED BY P Clark	DEPARTMENT NAME AND NO. TCO 1241	DATE 1/28/93	TEL. EXT.	NEXT ASSEMBLY NO.
RECEIVED BY Bob Stephens	DEPARTMENT NAME AND NO 1241	DATE 1/29/93	TEL. EXT	PART NO

INSPECTION	WORK ORDER NO.	STORES REC POSTED	SHIPPING ORDER REQUEST NO.	SMO NO	OTHER

TEXTRON Defense Systems

Textron Defense Systems/
Subsidiary of Textron, Inc.

201 Lowell Street
Wilmington, MA 01887

VERY SMALL QUANTITY GENERATOR

SELF TRANSPORT RECEIPT

Type And Quantity Of Waste (Not To Exceed 55 Gal.) 25 GAL - HAZARDOUS CHEMICAL WASTE

Name And Dept. Of Person Transporting Waste. R CLARK 1241 TCO

Area Supervisors Signature. Robert M. Clark Date 28 JAN, 93

(Lower Portion To Be Completed By TDS Environmental Representative Only)

Date Waste Received 2/1/93

Signature Michael Date Shipped For Disposal 3/18/93

Comments And/Or Problems 10 GAL KODAK DEVELOPER GBX - DILUTED/WATER
10 GAL KODAK FIXER (FIXER RAPID) - DILUTED/WATER - 5 GAL
KODAK ACETIC ~~[illegible]~~ ACID (STOP BATH) - DILUTED/WATER

NOTE: Upon completion of this receipt, a copy is to be mailed to the designated representative of the J-3 Range, at the below listed address:

TEXTRON Cape Operations, J-3 Range
Camp Edwards, MA 02542

(See Reverse For D.E.Q.E. Registration)

COMMONWEALTH OF MASSACHUSETTS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF HAZARDOUS WASTE
One Winter Street
Boston, Massachusetts 02108

Please print or type. (Form designed for use on elite (12-pitch) typewriter.)

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator US EPA ID No. MAD001363943 Manifest Document No. 00101
2. Page 1 of 1
Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
Textron Defense Systems
201 Lowell Street
Wilmington, MA 01887
ATTN. Mike Tremblay

4. Generator's Phone (508) 657-1101

A. State Manifest Document Number MA F286332
B. State Gen. ID Same

5. Transporter 1 Company Name Laidlaw Environmental Services (NorthEast) Inc
6. US EPA ID Number MAD000604447
C. State Trans. ID MA25817
D. Transporter's Phone (508) 683-1002

7. Transporter 2 Company Name
8. US EPA ID Number
E. State Trans. ID
F. Transporter's Phone ( )

9. Designated Facility Name and Site Address
Laidlaw Environmental Services (NorthEast) Inc.
300 Canal Street
Lawrence, MA 01840

10. US EPA ID Number MAD000604447
G. State Facility's ID Not Required
H. Facility's Phone (508) 683-1002

11. US DOT Description (Including Proper Shipping Name, Hazard Class, and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. Waste Acetic Acid Corrosive Material UN2790 (D002)	001	DF	00015	G	D002
b. Non Regulated Material	001	DF	00015	G	MA99
c. Non Regulated Material	[illegible]	[illegible]	[illegible]	[illegible]	MA99
d. N.O.S. Waste Paint Related Material Flammable Liquid [illegible] [illegible]	[illegible]	[illegible]	[illegible]	[illegible]	D001 D035 F003 F002 05

J. Additional Descriptions for Materials Listed Above (include physical state and hazard code.)
a. Waste Acetic Acid & Water (E-12)
b. Waste Kodak Fixer (PH = 4.1 - 6.9) (B-20)
c. Waste H2O Sodium Sulfite, Hydraquinone (Z-11)
d. Waste Paint, Toluene, Acetone (G-12)

K. Handling Codes for Wastes Listed Above
a. S01
b. S01
c. S01
d. S01

15. Special Handling Instructions and Additional Information In case of emergency contact: Laidlaw Environmental Services (NorthEast) Inc. at (508) 683-1002. NOTE: Line Item 11.a. 15-gallon drum with 5 gallons of liquid. Line Item 11.b. 15 gallon drum with 10 gallons of liquid. Line Item 11.c. 15 gallon drum with [illegible] gallons of liquid

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name Michael Tremblay
Signature Michael P Tremblay
Date Month Day Year 03 18 93

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name Jerry Radcliffe
Signature J Radcliff
Date Month Day Year 03 18 93

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name
Signature
Date Month Day Year

19. Discrepancy Indication Space

RECEIVED
MAR 26 1993
ENVIRONMENTAL PROTECTION

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name M. Calisto
Signature Michelle Calisto
Date Month Day Year [illegible]

Form Approved OMB No. 2050-0039, Expires 9-30-91
EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete.

COPY>3: FACILITY MAILS TO GENERATOR

MA F286332 COPY>3: FACILITY MAILS TO GENERATOR

LAIDLAW ENVIRONMENTAL SERVICES

Customer Notification And Certification

Statements with Original Signatures will be Accepted!

# 73228
4950 TEXTRON DEFENSE SYSTEMS
201 LOWELL ST.
WILMINGTON MA 01887

ator Name/Location:
I.D. Number: MAD001863943
Waste Profile or ARF Designation: X820 C1 C12 D12 E E12 G G12 G5 H I16 J J22 K16
est Number: MAF286328 MAF286329 MAF286330 MAF286331 MAF286332 MAF286333 MAF28633
Hazardous Waste Number(s): F MA99F006D007D006D008D011MA01F001D002D001D035
Waste Analysis Attached? YES____ NO X On file at facility. X
F002F003F005U123U201 X017P11P2 S5 T22W W22X22Y22Z11

tricted Waste Notification (Category 1)
I notify that I am familiar with the waste through analysis and testing or through knowledge of the waste to support this notification that the waste is not restricted as specified in 40 CFR 268, Subpart D and all applicable prohibitions set forth in 40 CFR 268.32 or RCRA Section 3004(d).

estricted Waste Notification (Category 2)
I notify that I am familiar with the waste through analysis and testing or through knowledge of the waste to support this notification that the waste is subject to the treatment standards specified in 40 CFR 268, Subpart D. Waste must be treated to the appropriate regulatory treatment standard, by the appropriate regulatory treatment method, or qualifies for a variance as described in Category 3; or meets the standard as described under Category 4.

** SEE DETAIL PAGE(S) **

For hazardous debris, the waste contains the following contaminants subject to treatment (check all that apply): __§ 268.45(b)(1)-Toxicity characteristic debris; __§ 268.45(b)(2)-Debris contaminated with listed waste; __§ 268.45(b)(3)-Cyanide reactive debris. This hazardous debris is subject to the alternative treatment standards of 40 CFR 268.45.

ponding Treatment Standard(s)

tegory 3 - Variance Notification
(3a) Restricted Waste Variance Notification
notify pursuant to 40 CFR 268.7(a)(3) that I am familiar with the waste through analysis and testing or through knowledge of the waste to support this notification that this waste is subject to a national capacity variance under 40 CFR 268 Subpart C, or a case-by-case extension under 40 CFR 268.5, or an exemption under 40 CFR 268.6.

Applicable Variance (Give the date the waste is subject to prohibitions)

(3b) Hazardous Debris Extension Notification
For the hazardous debris waste stream accompanying this notification, I notify that I have made the necessary submittals to my operating record, or files maintained pursuant to 40 CFR 268.7(a)(5), as described in the May 15, 1992 Federal Register (57 FR 20769), and therefore this hazardous debris shipment qualifies for the one-year generic case-by-case extension.

Applicable Variance (Give the date the waste is subject to prohibitions)

ed Waste Certification (Category 4)
certify under penalty of law that I personally examined and am familiar with the waste through analysis and testing or through knowledge of the waste to support this certification that the waste complies with the treatment standards specified in 40 CFR Part 268 Subpart D and all applicable prohibitions set forth in 40 CFR 268.32 or RCRA Section 3004(d). I believe that the information I submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting a false certification including the possibility of fine and imprisonment.

** SEE DETAIL PAGE(S) **

y 6 - Lab Pack Certification
(6a) Organometallic (inorganic)
certify under penalty of law that I personally have examined and am familiar with the waste and that the lab pack contains only the wastes specified Appendix IV to Part 268 or solid wastes not subject to regulation under 40 CFR Part 261. I am aware that there are significant penalties for submitting a false certification, including the possibility of fine or imprisonment.

Notification of Corresponding Treatment Standard: Incineration followed by stabilization of residues to demonstrate compliance with 40 CFR 268.42(c). (INCIN fb STABL)

b) Organic
certify under penalty of law that I personally have examined and am familiar with the waste through analysis and testing or through knowledge of the waste and that the lab pack contains only organic waste specified in Appendix V to Part 268 or solid wastes not subject to regulation under 40 CFR Part 261. I am aware that there are significant penalties for submitting a false certification, including the possibility of fine or imprisonment.

tification of Corresponding Treatment Standard: Incineration (INCIN)

SIGNATURE: Michael Tremblay DATE: 3/19/93
PRINT NAME: MICHAEL TREMBLAY TITLE: Environmental Technician

Generator Name/Location: TEXTRON DEFENSE SYSTEMS 301 LOWELL ST. WILMINGTON MA 01887

EPA I.D. Number: MAD001863943

Manifest Number: MAF286328 MAF226329 MAF286330 MAF286331 MAF286333 MAF286333 MAF286333

Waste Profile or ARF	Category No.	EPA or State Waste Code	Variance Date	Sub Category	Treatability Group (WW or NWW)	40 CFR Reference	Specific Treatment Technology	Legend (MG/L)
620	1	MA99						
C1	2A 4	F006D007 D006D008		CADMIUM	NWW	268.41(3) 268.43(3)		44=134
		D011		LEAD				
C12	1	MA01						
D12	1	MA01						
E	2A	F001			NWW			28=5.6
E12	2A	D002		ACID(PH<2)	WW	268.42(3)	DEACT	
G	2A	F001			NWW			26=28
G12	2A	D001F005 F002F003		IGNIT LIQ TOC>10%	NWW	268.42(3)	FSUBS RORGS INCIN 1	22=28 28=28 1=160 17=36

LEGEND FOR TREATMENT STANDARDS EXPRESSED AS CONCENTRATION

TABLE CCW-CONSTITUENT CONCENTRATION IN WASTES

F001-F005 spent solvent		Waste Water Containing Spent Solvents (in mg/l)	All other Spent Solvent Wastes (in mg/kg)
Legend #	Constituent Name		
1	Acetone	0.28	160
2	Benzene	0.070	3.7
3	n-Butyl alcohol	5.6	2.6
4	Carbon disulfide	0.014	NA*
5	Carbon tetrachloride	0.057	5.6
6	Chlorobenzene	0.057	5.7
7	Cresol (m- and p- isomers)	0.77	3.2
8	o-Cresol	0.11	5.6
9	Cyclohexanone	0.36	NA*
10	1,2-Dichlorobenzene	0.088	6.2
11	Ethyl acetate	0.34	33
12	Ethyl benzene	0.057	6.0
13	Ethyl ether	0.12	160
14	Isobutyl alcohol	5.6	170
15	Methanol	5.6	NA*
16	Methylene chloride	0.089*	33
17	Methyl ethyl ketone	0.28	36
18	Methyl isobutyl ketone	0.14	33
19	Nitrobenzene	0.068	14
20	Pyridine	0.014	16
21	Tetrachloroethylene	0.056	5.6
22	Toluene	0.080	28
23	1,1,1-Trichloroethane	0.054	5.6
24	1,1,2-Trichloroethane	0.030	7.6
25	Trichloroethylene	0.054	5.6
26	1,1,2-Trichloro-1,2,2-trifluoroethane	0.057	28
27	Trichloromonofluoro-methane	0.020	33
28	Xylenes (total)	0.32	28

TABLE CCWE CONSTITUENT CONCENTRATION IN WASTE EXTRACT

F001-F005 spent solvent		Concentrations (in mg/l) Waste Water Containing Spent Solvents	All other Spent Solvent Wastes
Legend #	Constituent Name		
29	Carbon disulfide	NA	4.8
30	Cyclohexanone	NA	0.75
31	Methanol	NA	0.75

NA: NOT APPLICABLE - These treatment standards are based on TOTAL CONCENTRATION (see TABLE CCW with constituent concentration treatment standards).

NOTE: Table CCWE should only be used if the F001-F005 solvent waste ONLY contains one, two, or three of the constituents listed. If ANY of the other constituents listed in table CCW are present, then a TOTAL CONSTITUENT test should be run and the corresponding legend numbers from TABLE CCW should be used (see instructions).

TECHNOLOGY BASED STANDARDS FOR F005

Legend #	Constituent Name	Technology Code Waste Waters	Technology Code Non Waste Waters
32	2-Ethoxyethanol	¹BIODG; or ²INCIN	INCIN
33	2-Nitropropane	³WETOX or CHOXD)fb CARBN; or INCIN	INCIN

F020-F023 and F026-F028 Dioxin Containing Waste

Legend #	Constituent Name		Concentration
34	HxCDD-All Hexachlorodibenzo-p-dioxins	<	1 ppb
35	HxCDF-All Hexachlorodibenzofurans	<	1 ppb
36	PeCDD-All Pentachlorodibenzo-p-dioxins	<	1 ppb
37	PeCDF-All Pentachlorodibenzofurans	<	1 ppb
38	TCDD-All Tetrachlorodibenzo-p-dioxins	<	1 ppb
39	TCDF-All Tetrachlorodibenzofurans	<	1 ppb
40	2,4,5-Trichlorophenol	<	0.05 ppm
41	2,4,6-Trichlorophenol	<	0.05 ppm
42	2,3,4,6 Tetrachlorophenol	<	0.10 ppm
43	Pentachlorophenol	<	0.01 ppm

CALIFORNIA LIST WASTES

44	Nickel		134 mg/l
45	Thallium		130 mg/l
46	Cyanide (Liquid)		1000 mg/l
47	Polychlorinated Biphenyls (PCB's)	<	50 ppm
48	Halogenated Organic Compounds (HOC's)	<	1000 mg/kg

*The methylene chloride treatment standard for wastewaters generated from pharmaceutical plants is 0.44 mg/l.

NA* These treatment standards are based on TCLP, not total constituent concentration (see TABLE CCWE with TCLP treatment standards).

* See 40 CFR § 268.7(b)(5)(iii) for detection limit considerations (FORM C Category 5b

1 BIODEGRADATION

2 INCINERATION

3 WET OXIDATION or CHEMICAL OXIDATION followed by CARBON ADSORPTION

REVISED: 04/92

FACILITY COPY

Generator Name/Location: TEXTRON DEFENSE SYSTEMS 201 LOWELL ST. WILMINGTON MA 01887

EPA I.D. Number: MAD001623943

Manifest Number: MAF226333 MAF226335 MAF226327 MAF226329 MAF226330 MAF226331 MAF226332

Waste Profile or ARF	Category No.	EPA or State Waste Code	Variance Date	Sub Category	Treatability Group (WW or NWW)	40 CFR Reference	Specific Treatment Technology	Legend MG/L
P2	1	MA01						
S2	2A	D003F005 D035D001		IGNITABLE REACTIVES	NWW	268.42(a)	DEACT	17=36 1=160 22=28
T22	2A	D007			WW	268.43(a)		
W	2A	D001D035 F005		IGNIT LIQ TOC>10%	NWW	268.42(a)	FSUBS RORGS INCIN	29=5.6 26=28 1=160 17=36 22=28 28=28
W22	2A	D007			NWW	268.41(a)		
X22	1	MA99						
Y22	1	MA99						
Z11	1	MA99						

LEGEND FOR TREATMENT STANDARDS EXPRESSED AS CONCENTRATION

W CONSTITUENT CONCENTRATION IN WASTES

F001-F005 spent solvent

Legend #	Constituent Name	Waste Water Containing Spent Solvents (in mg/l)	* All other Spent Solvent Wastes (in mg/kg)
	Acetone	0.28	160
	Benzene	0.070	3.7
	n-Butyl alcohol	5.6	2.6
	Carbon disulfide	0.014	NA*
5	Carbon tetrachloride	0.057	5.6
	Chlorobenzene	0.057	5.7
	Cresol (m- and p- isomers)	0.77	3.2
	o-Cresol	0.11	5.6
	Cyclohexanone	0.36	NA*
	1,2-Dichlorobenzene	0.088	6.2
	Ethyl acetate	0.34	33
12	Ethyl benzene	0.057	6.0
13	Ethyl ether	0.12	160
	Isobutyl alcohol	5.6	170
	Methanol	5.6	NA*
	Methylene chloride	0.089*	33
	Methyl ethyl ketone	0.28	36
	Methyl isobutyl ketone	0.14	33
	Nitrobenzene	0.068	14
20	Pyridine	0.014	16
21	Tetrachloroethylene	0.056	5.6
	Toluene	0.08	28
	1,1,1-Trichloroethane	0.054	5.6
	1,1,2-Trichloroethane	0.030	7.6
	Trichloroethylene	0.054	5.6
	1,1,2-Trichloro-1,2,2-trifluoroethane	0.057	28
	Trichloromonofluoro-methane	0.02	33
	Xylenes (total)	0.32	28

TABLE CCWE-CONSTITUENT CONCENTRATION IN WASTE EXTRACT

F001-F005 spent solvent

Legend #	Constituent Name	Concentrations (in mg/l) Waste Water Containing Spent Solvents	All other Spent Solvent Wastes
29	Carbon disulfide	NA	4.8
30	Cyclohexanone	NA	0.75
31	Methanol	NA	0.75

NA: NOT APPLICABLE - These treatment standards are based on TOTAL CONCENTRATION (see TABLE CCW with constituent concentration treatment standards).

NOTE: Table CCWE should only be used if the F001-F005 solvent waste ONLY contains one, two, or three of the constituents listed. If ANY of the other constituents listed in table CCW are present, then a TOTAL CONSTITUENT test should be run and the corresponding legend number from TABLE CCW should be used (see instructions).

TECHNOLOGY-BASED STANDARDS FOR F005

Legend #	Constituent Name	Technology Code: Waste Waters	Technology Code: Non Waste Waters
32	2-Ethoxyethanol	BIODG; or INCIN	INCIN
33	2-Nitropropane	WETOX or CHOXD)fb CARBN; or INCIN	INCIN

F020-F023 and F026-F028 dioxin Containing Waste

Legend #	Constituent Name		Concentration
34	HxCDD-All Hexachlorodibenzo-p-dioxins	<	1 ppb
35	HxCDF-All Hexachlorodibenzofurans	<	1 ppb
36	PeCDD-All Pentachlorodibenzo-p-dioxins	<	1 ppb
37	PeCDF-All Pentachlorodibenzofurans	<	1 ppb
38	TCDD-All Tetrachlorodibenzo-p-dioxins	<	1 ppb
39	TCDF-All Tetrachlorodibenzofurans	<	1 ppb
40	2,4,5-Trichlorophenol	<	0.05 ppm
41	2,4,6-Trichlorophenol	<	0.05 ppm
42	2,3,4,6-Tetrachlorophenol	<	0.10 ppm
43	Pentachlorophenol	<	0.01 ppm

CALIFORNIA LIST WASTES

Legend #	Constituent Name		Concentration
44	Nickel		134 mg/l
45	Thallium		130 mg/l
46	Cyanide (Liquid)		1000 mg/l
47	Polychlorinated Biphenyls (PCB's)	<	50 mg/l
48	Halogenated Organic Compounds (HOC's)	<	1000 mg/l

* methylene chloride treatment standard for wastewaters generated from pharmaceutical plants = 0.44 mg/L

s treatment standards are based on TCLP, not total constituent concentration (see TABLE CCWE with TCLP treatment standards).

- • See 40 CFR § 268.7(b)(5)(iii) for detection limit considerations (FORM C Category 5b)
- 1 BIODEGRADATION
- 2 INCINERATION
- 3 WET OXIDATION or CHEMICAL OXIDATION followed by CARBON ADSORPTION

06/92

CILITY COPY

APPENDIX B

TANK INSTALLATION AND REMOVAL DOCUMENTATION

CERTIFIED ENGINEERING AND TESTING COMPANY, INC.
25 Mathewson Drive
Weymouth, MA 02189
(617) 337-7887

Client:NORTHEAST TANK SERVICES

Client Number:LINLIN

Address: 349 LINCOLN STREET, BLDG. 48
HINGHAM, MA 02043

Project Number: -

Client Contact: ROB DOUGLAS

Date Received: 6/26/91

Date Reported: 7/09/91

Client Job Number:

Sample Series: 91-06-103

Certified Sample Number	Client Identification	Sample Location
91-06-103.01	J-3-3	J-3-3
91-06-103.02	J-3-6	J-3-6
91-06-103.03	J-3-7	J-3-7

Textron
[illegible]

---

the best of my knowledge the information contained in this report is a true
nd accurate statement.

thorized By:
John J. Sulkowski, Laboratory Manager

Mathewson Drive
Weymouth, Massachusetts
02189

CHAIN OF CUSTODY RECORD

DUE DATE: 7-10-91

COMPANY: Northeast Tank Services
349 Lincoln St. Bldg. 48
Hingham MA 02043.

PHONE: ( ) 740-4090 FAX#( ) 740-0174
P.O.# :
CLIENT CONTACT: Rob Douglas
PROJECT #:

SAMPLE TYPE
1. WATER
2. SOIL
3. SLUDGE
4. OIL
5. TISSUE
OTHER

CONTAINER TYPE
P-PLASTIC
G-GLASS
V-VOA

ANALYSES

SAMPLE #	SAMPLE IDENTIFICATION	SAMPLE TYPE	CONTAINER SIZE	CONTAINER TYPE	#	SAMPLING DATE	SAMPLING TIME	PRESERVATIVE	TPH
1	J-3.3	2	L	G		6.19.91	3:30		X
2	J-3.6	2	L	G		6.19.91	10:00 am		X
3	J-3.7	2	L	G		6.19.91	11:00 am		X

RELINQUISHED BY: Tony Sorrentino	DATE: 6-20-91 TIME: 10:15	RECEIVED BY:	DATE: TIME:
RELINQUISHED BY:	DATE: TIME:	RECEIVED BY:	DATE: TIME:
RELINQUISHED BY:	DATE: TIME:	RECEIVED FOR LAB BY: C. Deluise	DATE: TIME: 10:15

METHOD OF SHIPMENT:

SPECIAL INSTRUCTIONS:

☐ RUSH ...... DAY TURN AROUND

☒ REGULAR

paid $195.00 JC

in advance!

CERTIFIED ENGINEERING AND TESTING COMPANY, INC.
25 Mathewson Drive
Weymouth, MA 02189
(617) 337-7887

REFERENCES

1 "Test Methods for Evaluating Solid Waste, EPA SW846, Third Edition," USEPA Office of Solid Waste and Emergency Response, Washington, D.C., November, 1986.

2 "Standard Methods for the Examination of Water and Wastewater, Sixteenth Edition," American Public Health Association, Washington, D.C., 1985.

3 "Methods for Chemical Analysis of Water and Wastes," U.S. EPA, Cincinnati, OH, March, 1983.

4 "NIOSH Manual of Analytical Methods, Third Edition," U.S. Department of Health and Human Services, Cincinnati, OH, February, 1984.

5 40 CFR Part 136, July 1, 1987.

6 "Annual Book of ASTM Standards," Vol. 11.02, 1989.

7 "Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water," USEPA/EMSL, Cincinnati, OH.

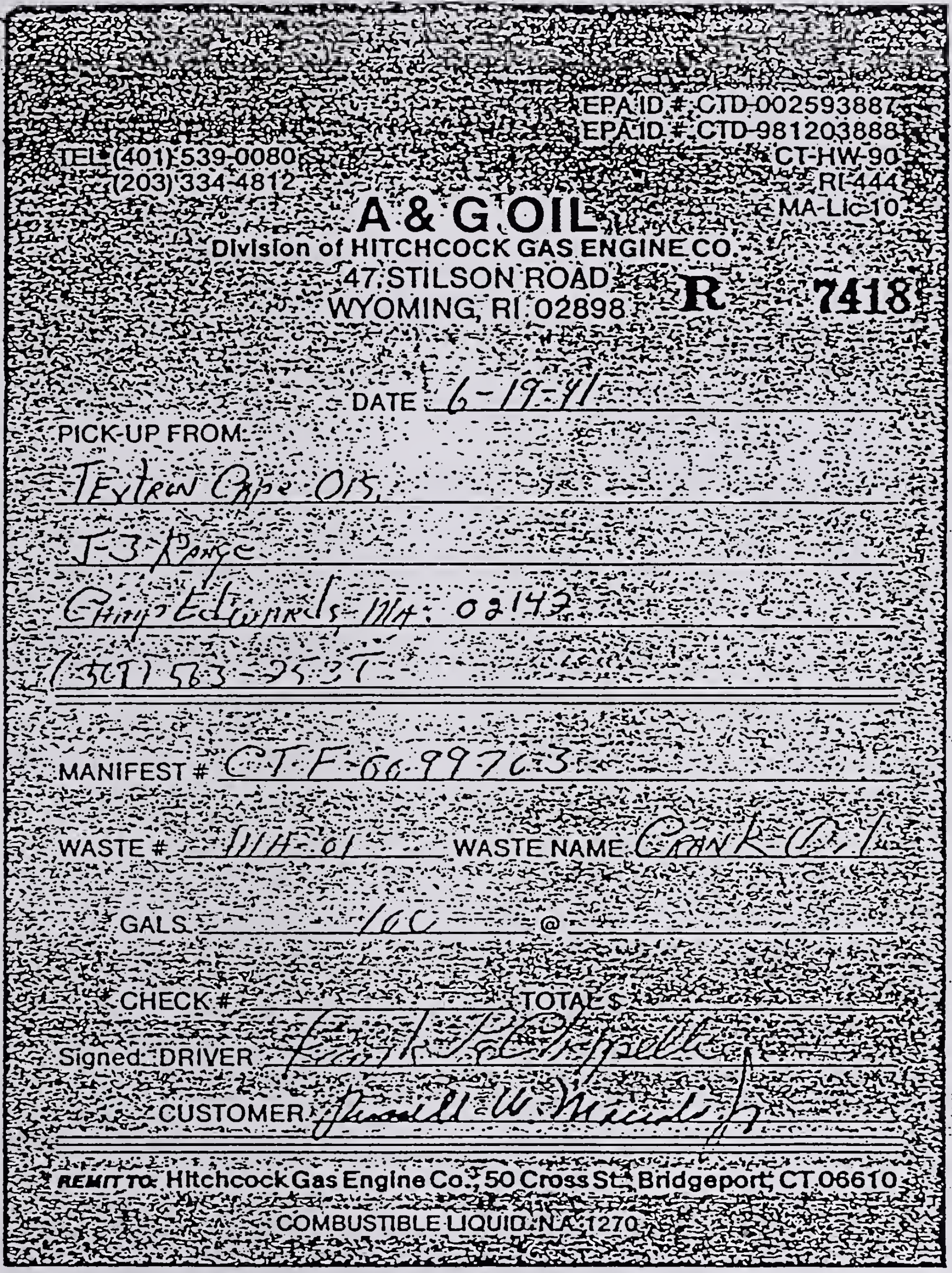
8 "Test Methods for Nonconventional Pesticides Chemicals Analysis of Industrial and Municipal Wastewater," U.S. EPA, Cincinnati, OH, January, 1983.

9 "Measurement of Purgeable Organic Compounds in Drinking Water by Gas Chromatography/Mass Spectrometry," Method 524, USEPA/EMSL, Cincinnati, OH.

10 "Quantitation in Elemental Analysis," H. Kaiser, Analytical Chemistry, Volume 42, Number 2, February, 1970, Pages 24A-32A.

11 "Handbook for Analytical Quality Control in Water and Wastewater Laboratories," EPA-600/4-79-019, USEPA/EMSL, Cincinnati, OH, March, 1979.

12 "Guidelines for Data Acquisition and Data Quality Evaluation in Environmental Chemistry," Analytical Chemistry, Volume 52, Number 14, December, 1980, Pages 2242-2294.



EPA ID #: CTD-002593887
EPA ID #: CTD-981203888
CT-HW-90
RI-444
MA-Lic-10

TEL (401) 539-0080
(203) 334-4812

A & G OIL
Division of HITCHCOCK GAS ENGINE CO.
47 STILSON ROAD
WYOMING, RI 02898

R 7418

DATE 6-19-91

PICK-UP FROM:
Textron Cape Ops.
J-3 Range
Camp Edwards, MA. 02143
(508) 563-2537

MANIFEST # CTF-0099763

WASTE # MA-01 WASTE NAME Crank Oil

GALS. 100 @

CHECK # TOTAL $

Signed: DRIVER

CUSTOMER

REMIT TO: Hitchcock Gas Engine Co., 50 Cross St., Bridgeport, CT 06610

COMBUSTIBLE LIQUID N.A. 1270

HM-2 REV 9 86

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Hazardous Waste MANIFEST PROGRAM. State Office Building
Hartford. CT 06106

FOR STATE USE ONLY

Please type (or print) *(Form designed for use on elite (12-pitch) typewriter.)*

UNIFORM HAZARDOUS WASTE MANIFEST

1. Generator's US EPA ID No. — Manifest Document No.

2. Page 1 of 1

Information in the shaded areas is not required by Federal law, but may be required by State law.

3. Generator's Name and Mailing Address

4. Generator's Phone ( )

A. State Manifest Document Number **CT F 0099703**

B. G.S.I. (Gen. Site Address) Same

5. Transporter 1 Company Name Hitchcock Gas Engine Co.

6. US EPA ID Number CTD.002593317

7. Transporter 2 Company Name

8. US EPA ID Number

C. S.T.I. (Trans. Lic. Plate #)

D. Tran. Phone (401-539-0980

9. Designated Facility Name and Site Address
Hitchcock Gas Engine Co.
1 Seaview Avenue
Bridgeport, CT 06607

10. US EPA ID Number CTD.981203389

E. S.T.I. (Trans. Lic. Plate #)

F. Tran. Phone ( )

G. State Facility's ID (Not Required)

H. Facility's Phone 203-334-4812

11. US DOT Description *(Including Proper Shipping Name, Hazard Class, and ID Number)*	12. Containers No	12. Containers Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a. Waste Oil, n.o.s., Combustible Liquid, NA 1270	001	TT		G	EPA STATE MA-01
b.					EPA STATE
c.					EPA STATE
d.					EPA STATE

J. Additional Descriptions for Materials Listed Above
a. CT Regulated Waste
b. Waste Petroleum Oil
c. non-RCRA-hazardous
d.

K. Handling Codes for Wastes Listed Above

	Interim	Final		Interim	Final
a.			c.		
b.			d.		

15. Special Handling Instructions and Additional Information
24 Hour Emergency Contact #( )_____-______ MA Retail Cert.#__________
ERG# 27 -Attached

Point of Departure:

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations, and all applicable State laws and regulations.

If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford.

Printed/Typed Name — Signature — Month Day Year

17. Transporter 1 Acknowledgement of Receipt of Materials

Printed/Typed Name — Signature — Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials

Printed/Typed Name — Signature — Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.

Printed/Typed Name — Signature — Month Day Year

EPA Form 8700-22 (Rev. 9/88) --- Form Approved OMB No.2050-0039. Expires 9/30/91. Previous edition is obsolete.

GLOBAL TANK SERVICES, INC.
4 Turgeon Lane PO Box 678
Somersworth, NH 03878
1-800-262-0106

August 27, 1990

Textron Defense Systems
201 Lowell St.
Wilmington, MA 01887

Attn: Mr. Rudy Longo
RE: Underground Tank Testing Results

Dear Mr. Longo,

Global Tank Services, Inc. performed Petro-Tite Leak Detection tank tests on the underground storage tanks at the J-3 Range at Otis AFB. The tests were conducted by a certified technician in conformance with the National Fire Protection Association Pamphlet 329. The results of the test performed on the tank systems are as follows:

Date of Test	Tank Size	Product	Result	Leak Rate
8/21/90	2000 gal	fuel oil #2	passed	-.014Gph
8/21/90	550 gal	fuel oil #2	passed	+.017Gph
8/22/90	550 gal	fuel oil #2	passed	-.005Gph

A copy of this letter and reports have been sent to the Otis Fire Department.

If you have any questions or need assistance please do not hesitate to contact me.

Very truly yours,
GLOBAL TANK SERVICES, INC.

Diane LaCourse

Diane LaCourse

APPENDIX C

SOIL, GEOLOGY AND HYDROLOGY INFORMATION

indicate that the county had 675 farms in 1920. Approximately 18 percent of the acreage was used for agricultural purposes.

Present trends for agriculture in Cape Cod are towards small, diversified farms with a retail marketing system consisting of roadside stands or pick-your-own enterprises. In 1984, there were approximately 175 agricultural enterprises on about 5,000 acres of land. Much of the land once used for agriculture has been abandoned and has reverted to forest land or has been subdivided for residential uses.

The cropland remaining today is interspersed with residential and commercial areas. This arrangement offers direct opportunities as well as limitations for the future of agriculture in Barnstable County. Population increases have expanded a market for fresh agricultural products, but the development associated with these increases reduces the acreage available for agricultural uses.

Geology

Robert N. Oldale, geologist, U.S. Geological Survey, helped prepare this section.

The landscape of Barnstable County owes its origin to the last continental glacier and to the rise in sea level that followed glaciation. The moving ice scraped, ground, and picked up the bedrock of southern New England and deposited it as the glacial and postglacial sediments of Cape Cod. The rock debris, called drift, was carried south by the ice and deposited along the ice front. The result was the glacial landforms of Cape Cod. Later, as the sea drowned the glacial cape, the drift along the shoreline was eroded and redeposited as beaches and spits. Windblown sand was deposited as dunes.

The exact age of the glacial deposits is not known. The deposits do not date back to more than 18,000 to 20,000 years ago, when the continental glacier reached its maximum advance and extended as far southward as Nantucket and Martha's Vineyard *(7)*. They are older than the glacial deposits near Boston, which, according to radiocarbon dating, are about 14,000 years old *(4)*.

The glacier in southeastern Massachusetts was formed into lobes by basins in the underlying bedrock *(13)*. The lobes occupied the present sites of Buzzard's Bay, Cape Cod Bay, and the Great South Channel to the east of Cape Cod. Generally, the two western lobes contributed drift to the inner part of Cape Cod and the South Channel lobe contributed drift to the outer part. Retreat of the lobes was sequential from west to east. Generally, the oldest deposits were laid down by the Buzzard's Bay lobe and the youngest deposits were laid down by the South Channel lobe *(9)*.

A generalized geologic map of Barnstable County was compiled from detailed 7.5-minute geologic maps made by the U.S. Geological Survey at a scale of 1:31,680 or 1:24,000 *(8, 11)*. The map shows the distribution of geologic units (fig. 3).

Rock debris carried southward by the continental glacier was deposited along the ice front. In areas where the debris was laid down directly by the ice, deposits are unsorted and unstratified. Unstratified drift, or till, is made up of rock material of all sizes, ranging from boulders tens of feet in size to tiny particles of clay. Till is commonly associated with moraines and areas of knob and kettle topography.

In most places the debris was sorted by meltwater streams and deposited as stratified drift. In the ice-contact zone the depositional environment was chaotic. It was characterized by rapid changes in stream volume and stream course. In this zone the stratified drift is coarsest, mostly gravel and sand, and includes till and boulders deposited by the ice. Away from the ice-contact zone, the stratified drift becomes increasingly more sorted and finer grained. These outwash deposits are mostly sand and gravelly sand. On Cape Cod most of the meltwater streams flowed into preglacial lakes where very fine sand, silt, and clay were deposited *(9)*.

Glacial deposits make up the distinctive landforms that are the basis for geologic mapping on Cape Cod. The most prominent landforms are the Buzzard's Bay and Sandwich Moraines. These landforms were formed by readvances of the Buzzard's Bay and Cape Cod Bay lobes against ice-contact margins of the Mashpee Pitted Plain and the Barnstable Outwash Plain. Advancing ice displaced the deposits underlying the outwash plains by thrusting and folding *(10)*. The moraine surface is characterized by ridges, knobs, and kettles and by ridges that run approximately parallel to the trend of the moraine.

Outwash plains are the most common glacial landform. On the inner part of Cape Cod, the outwash plains slope southward. They were formed by streams that drained the Cape Cod Bay lobe. On the outer part of the cape, the outwash plains slope westward. They were formed by meltwater that drained the South Channel lobe.

All outwash plains on Cape Cod are incomplete formations in that their downstream ends have been washed away by marine erosion. Except for the Harwich Outwash Plain and possibly the Eastham Outwash Plain, the ice-contact heads have been destroyed by overriding waves or by marine erosion. The ice-contact head of the Harwich Outwash Plain has been preserved, however, because it was protected from marine erosion by glacial deposits between it and Cape Cod Bay.

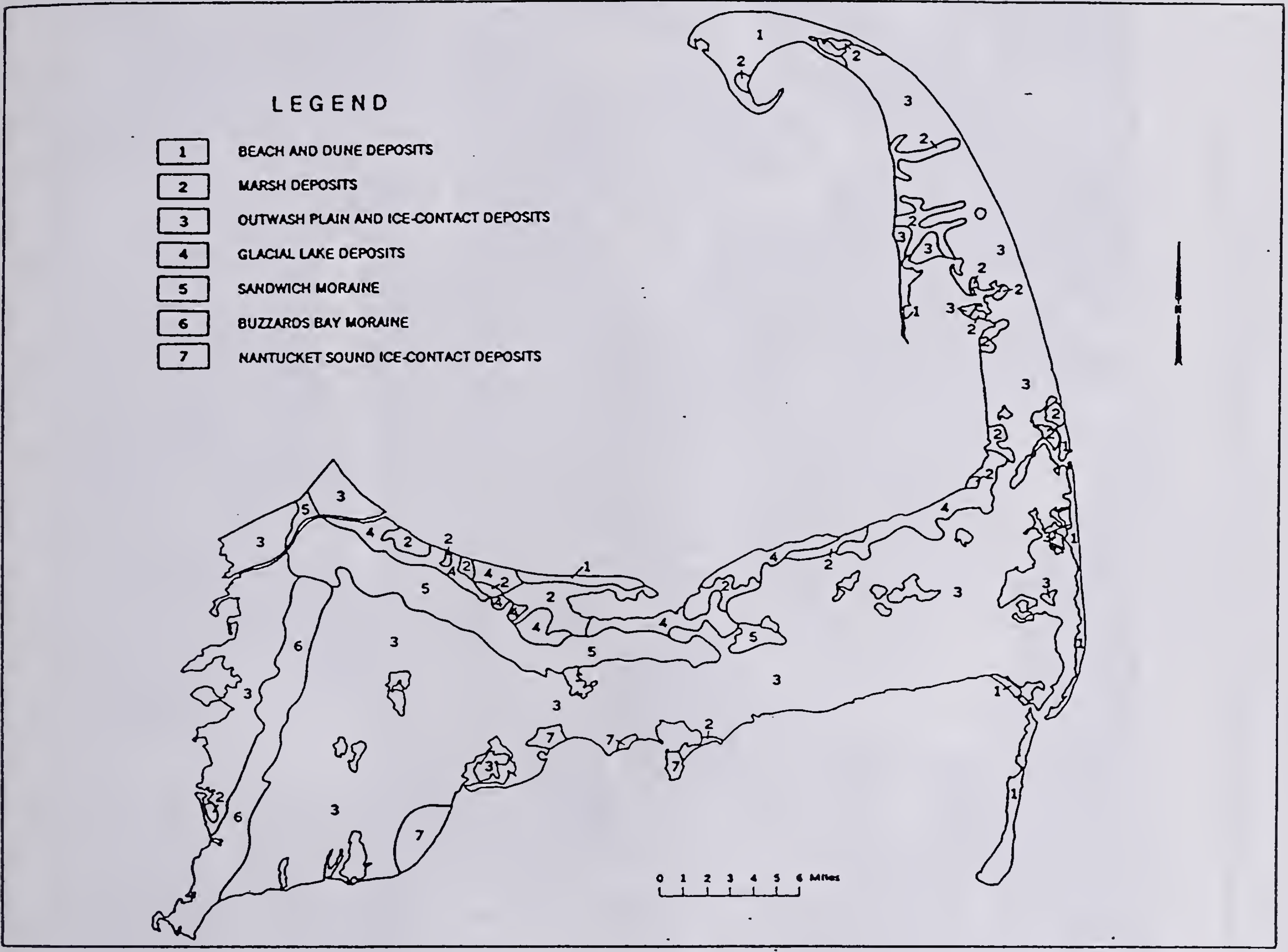


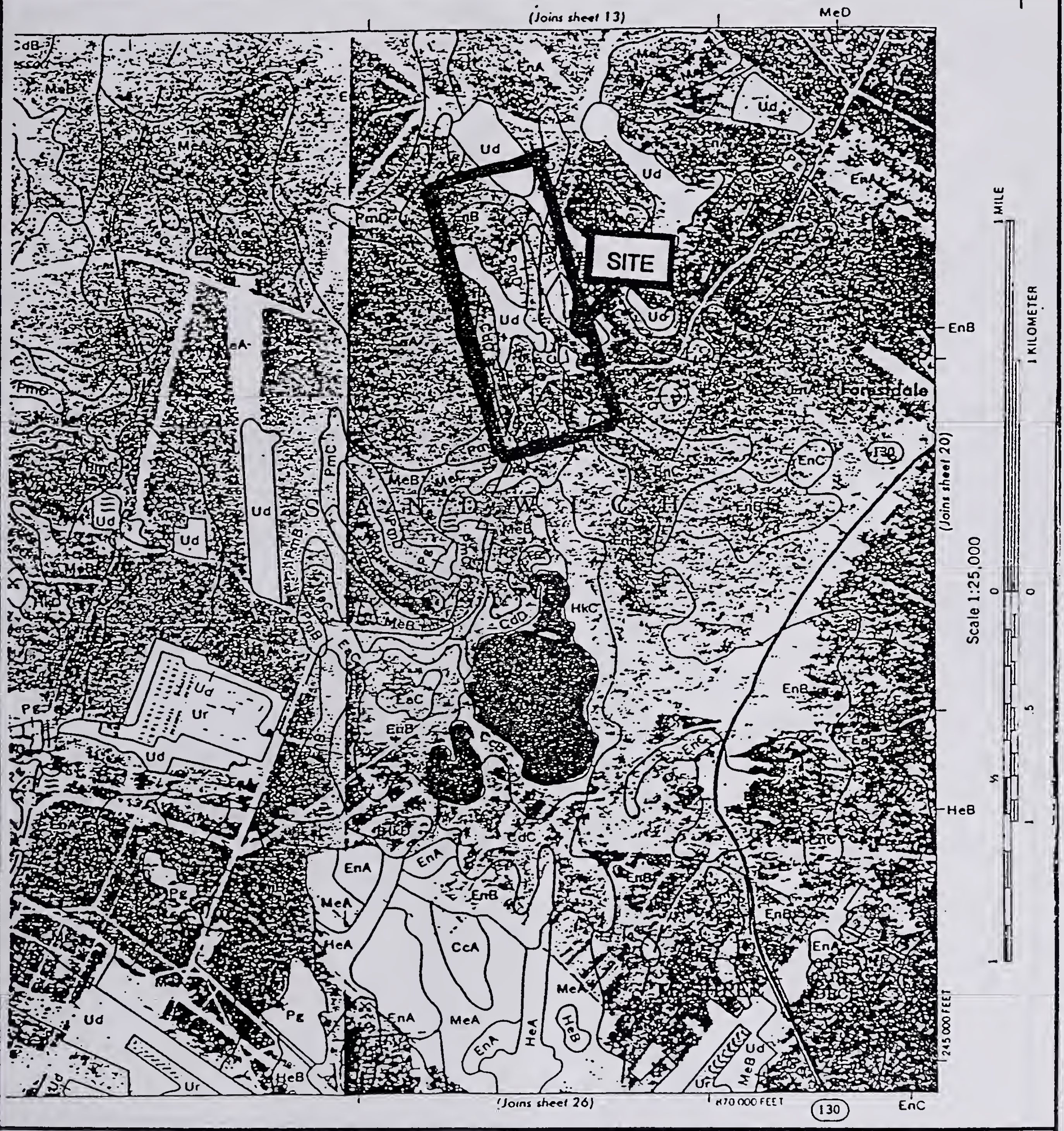
Figure 3.—Geologic map of Barnstable County.

The surface of the outwash plains in Barnstable County is interrupted by kettle holes that were originally the sites of ice blocks buried by outwash deposits. In some areas the kettle holes are deep enough to expose the water table and are ponded. The outwash plains are cut by valleys that are dry in all but their lower reaches, which are drowned by the sea. The valleys were cut by streams under a cold, nearly glacial climate after outwash deposition ceased and before the buried ice blocks melted. Permanently frozen ground may have nfluenced the formation of these valleys, but there is no undeniable evidence of permafrost.

Knob-and-kettle topography or large isolated kames ormed when stratified drift filled holes in the ice. In places the stratified drift surface formed areas that did not have a broad, stream-graded surface. These areas are mapped as ice-contact deposits.

A thin ubiquitous layer of windblown silt and sand caps the glacial deposits. Generally only a few feet thick, the material was deposited when the drift surface was covered with little vegetation. The windblown deposits were mixed with the underlying drift by frost action and contain wind-polished stones called ventifacts.

The oldest postglacial deposits on Cape Cod are freshwater sediments laid down in depressions on the glacial surface. These sediments include reworked glacial drift, mostly sand, silt, clay, and organic material.



SOURCE: Barnstable County Soil Survey, March 1993,
By: USDA Soil Conservation Service

N

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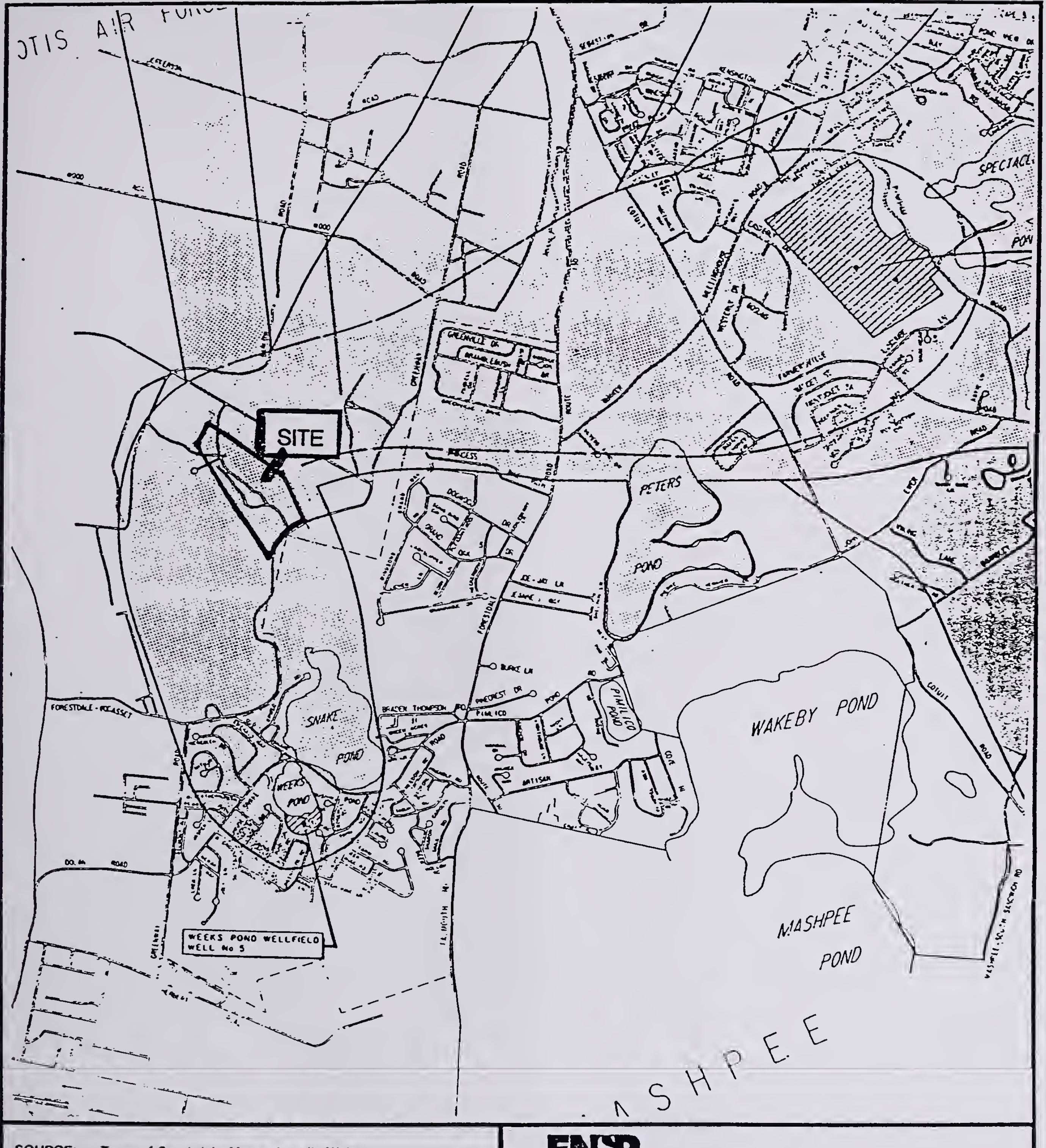
FIGURE C-2

SOIL MAP

Textron Cape Operations J-3 Range
Greenway Road
Otis Air Force Base, Sandwich, MA

DRAWN: JMG	DATE: 12/93	PROJECT NO.:	ARE
FILE NO.: tdsc2.flg	CHECKED: jmg	6630-035	1



SOURCE: Town of Sandwich, Massachusetts Water Resource Districts, October 1, 1989

N

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FIGURE C-3

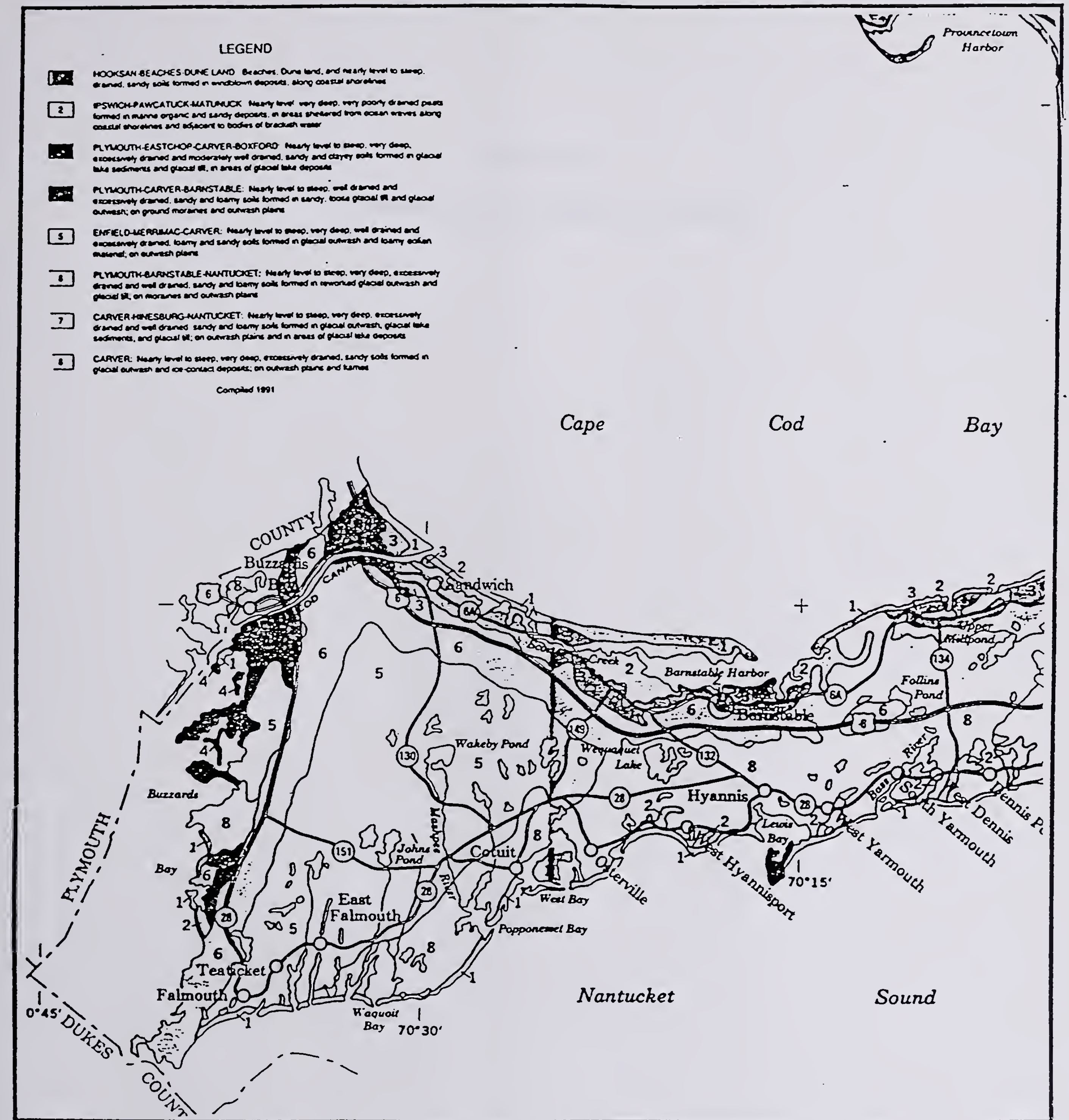
ZONES OF CONTRIBUTION

Textron Cape Operations J-3 Range
Greenway Road
Otis Air Force Base, Sandwich, MA

DRAWN: JMG	DATE: November 30, 1993	PROJECT NO.:	REV:
FILE NO.: tdsc3.flg	CHECKED: jmg	6630-035	1

APPENDIX D

INCOMPATIBLE USE ZONE (ICUZ) MAPS



LEGEND

1	HOOKSAN-BEACHES-DUNE LAND: Beaches, Dune land, and nearly level to steep, drained, sandy soils formed in windblown deposits, along coastal shorelines
2	IPSWICH-PAWCATUCK-MATUNUCK: Nearly level, very deep, very poorly drained peats formed in marine organic and sandy deposits, in areas sheltered from ocean waves along coastal shorelines and adjacent to bodies of brackish water
3	PLYMOUTH-EASTCHOP-CARVER-BOXFORD: Nearly level to steep, very deep, excessively drained and moderately well drained, sandy and clayey soils formed in glacial lake sediments and glacial till, in areas of glacial lake deposits
4	PLYMOUTH-CARVER-BARNSTABLE: Nearly level to steep, well drained and excessively drained, sandy and loamy soils formed in sandy, loose glacial till and glacial outwash; on ground moraines and outwash plains
5	ENFIELD-MERRIMAC-CARVER: Nearly level to steep, very deep, well drained and excessively drained, loamy and sandy soils formed in glacial outwash and loamy eolian material; on outwash plains
6	PLYMOUTH-BARNSTABLE-NANTUCKET: Nearly level to steep, very deep, excessively drained and well drained, sandy and loamy soils formed in reworked glacial outwash and glacial till; on moraines and outwash plains
7	CARVER-HINESBURG-NANTUCKET: Nearly level to steep, very deep, excessively drained and well drained, sandy and loamy soils formed in glacial outwash, glacial lake sediments, and glacial till; on outwash plains and in areas of glacial lake deposits
8	CARVER: Nearly level to steep, very deep, excessively drained, sandy soils formed in glacial outwash and ice-contact deposits; on outwash plains and kames

Compiled 1991

SOURCE: Barnstable County Soil Survey, March 1993,
By: USDA Soil Conservation Service

N

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ENSR Consulting and Engineering

FIGURE C-1

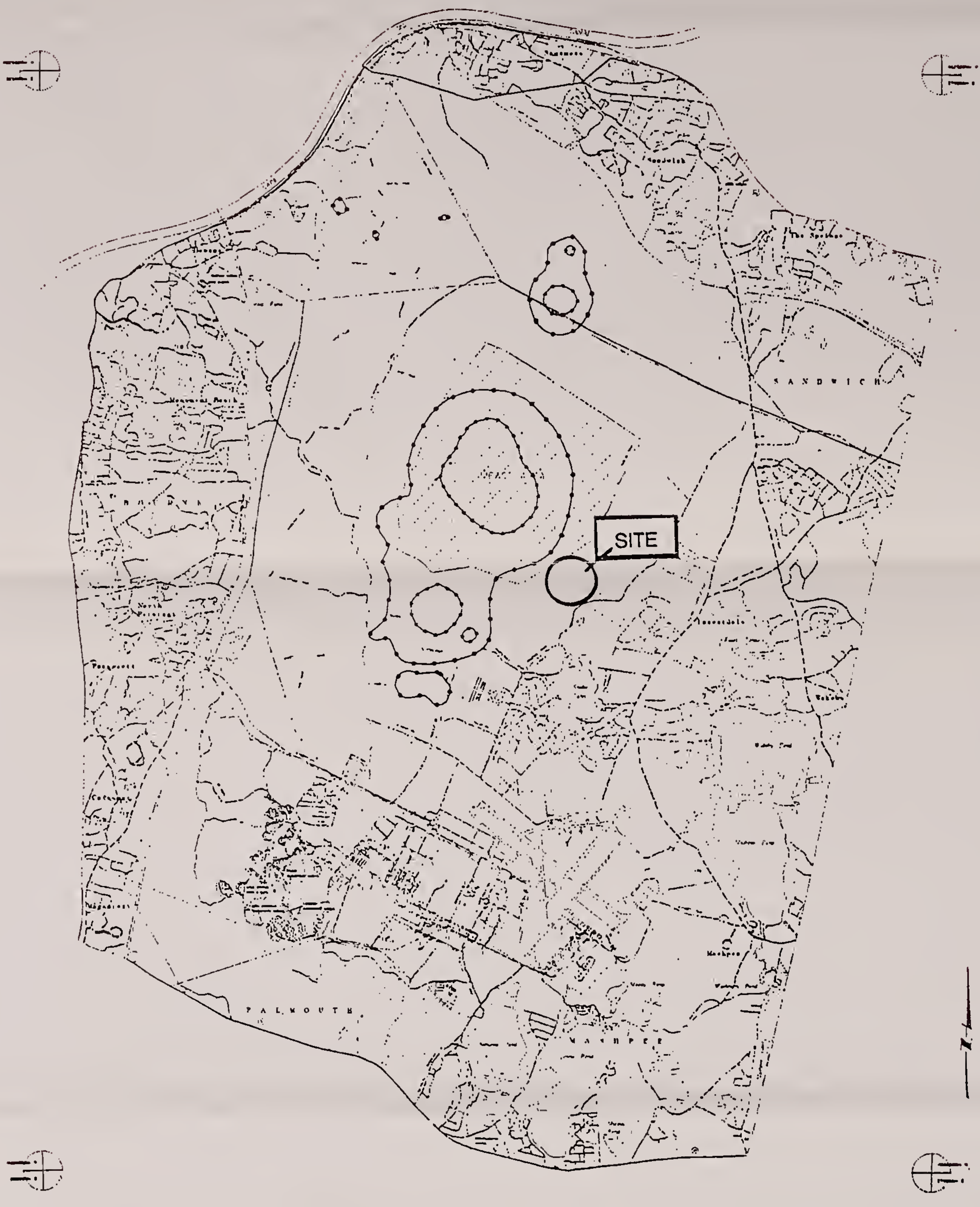
GENERAL SOIL MAP CAPE COD

Textron Cape Operations J-3 Range
Greenway Road
Otis Air Force Base, Sandwich, MA

DRAWN: JMG	DATE: November 29, 1993	PROJECT NO.:	ARE
FILE NO.: tdsc1.flg	CHECKED: jmg	6630-035	1

APPENDIX D

INCOMPATIBLE USE ZONE (ICUZ) MAPS

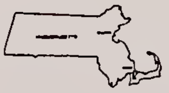


LEGEND

ZONE II — C-Weighted Day-Night Noise Levels for Large Amplitude Impulsive Noise (Artillery and Mortar Fire)

ZONE III

Scale



Data Source:

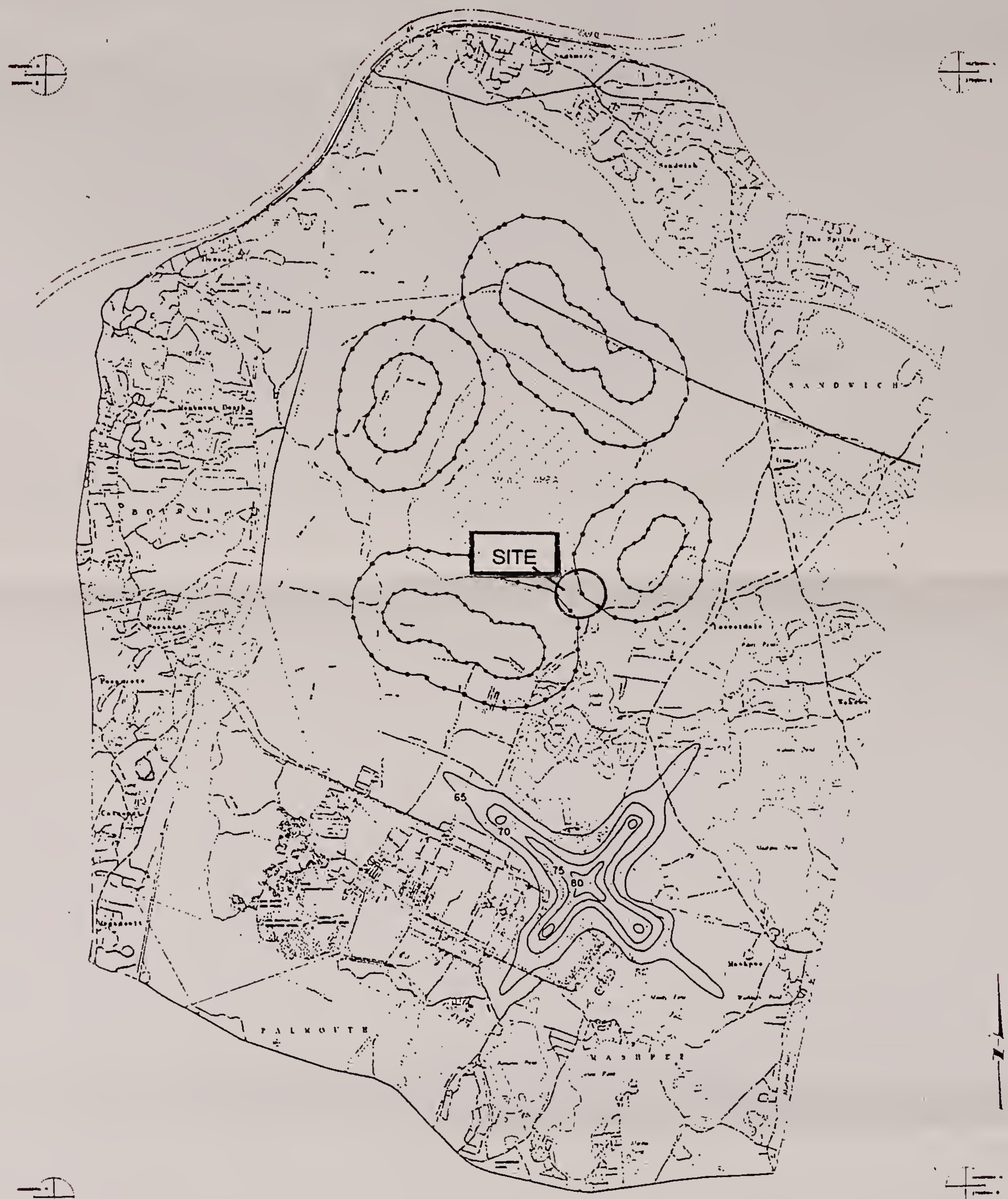
THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS MILITARY DIVISION
FACILITIES ENGINEERING

MAP 19

NOISE ZONE, C-WEIGHTED

Date Prepared: March 1991

JMM James M. Montgomery
Consulting Engineers, Inc



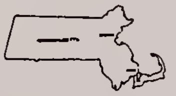
LEGEND

— A-Weighted Day-Night Noise Levels In dB

ZONE II — A-Weighted Day-Night Noise Levels For Small Arms Ranges

ZONE III

Scale



THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS MILITARY DIVISION
FACILITIES ENGINEERING

MAP 20

NOISE ZONE, A-WEIGHTED

Data Source: [illegible]

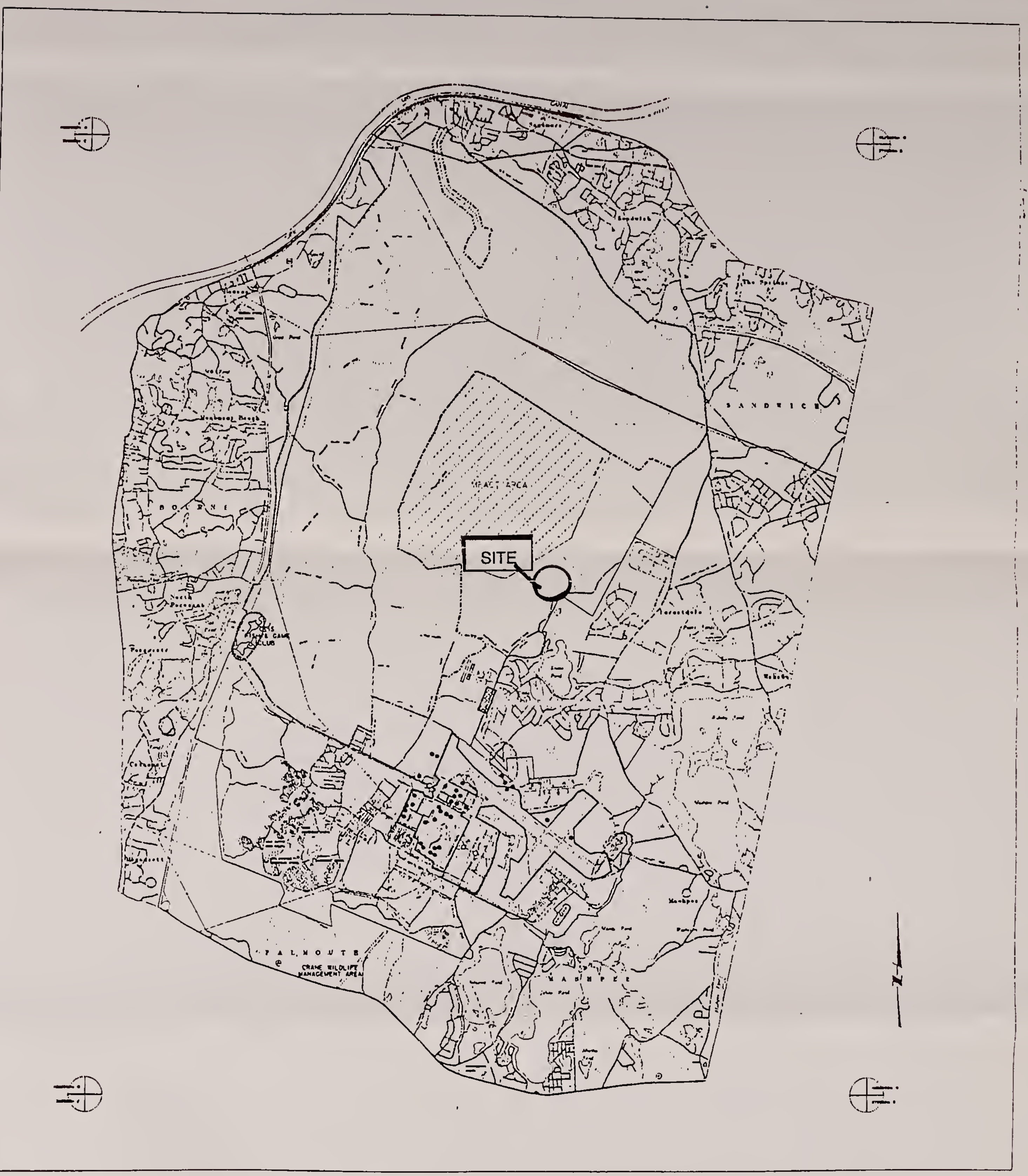
Date Prepared: March '91

JMM James M. Montgomery
Consulting Engineers, Inc.

Wayzata Minnesota

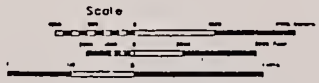
APPENDIX E

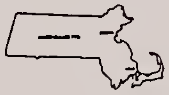
SUPPORTING DOCUMENTATION FOR ECOLOGICAL BASELINE EVALUATION



LEGEND

▭	Upland Sandpiper Habitat (Massachusetts Endangered Species)
▨	Northern Harrier (Marsh Hawk) Habitat (Massachusetts Threatened Species)
●	Grasshopper Sparrow Habitat (Massachusetts Special Concern Species)
▩	Sandplain Flax Habitat (Massachusetts Special Concern Plant Species), also in this area are Little Ladies'-tresses and Nuttall's Milkwort (On Massachusetts Watch List - Formerly considered rare)
▭	Umbrella-grass and Hyssop Hedge-nettle Habitat (On Massachusetts Watch List - Formerly considered rare)
◆	Osprey Nest
-----	Deer Hunting Area Boundary





Data Source:

1990 Edition Atlas of Estimated Habitats of State-listed Rare Wetlands Wildlife, Natural Heritage and Endangered Species Program, valid through December 31, 1990. (Delineates rare wetland wildlife habitat only).

Rare Grasslands Birds and Management Recommendations for Camp Edwards, Otis Air National Guard Base, R.P. White and Dr. S. M. Melvin, November 1985.

Inventory and Management of Endangered and Threatened Wildlife on Camp Edwards and Otis Air National Guard Base, Massachusetts, Dr. S. M. Melvin, National Heritage Program, Massachusetts Division of Fisheries and Wildlife, August 1984.

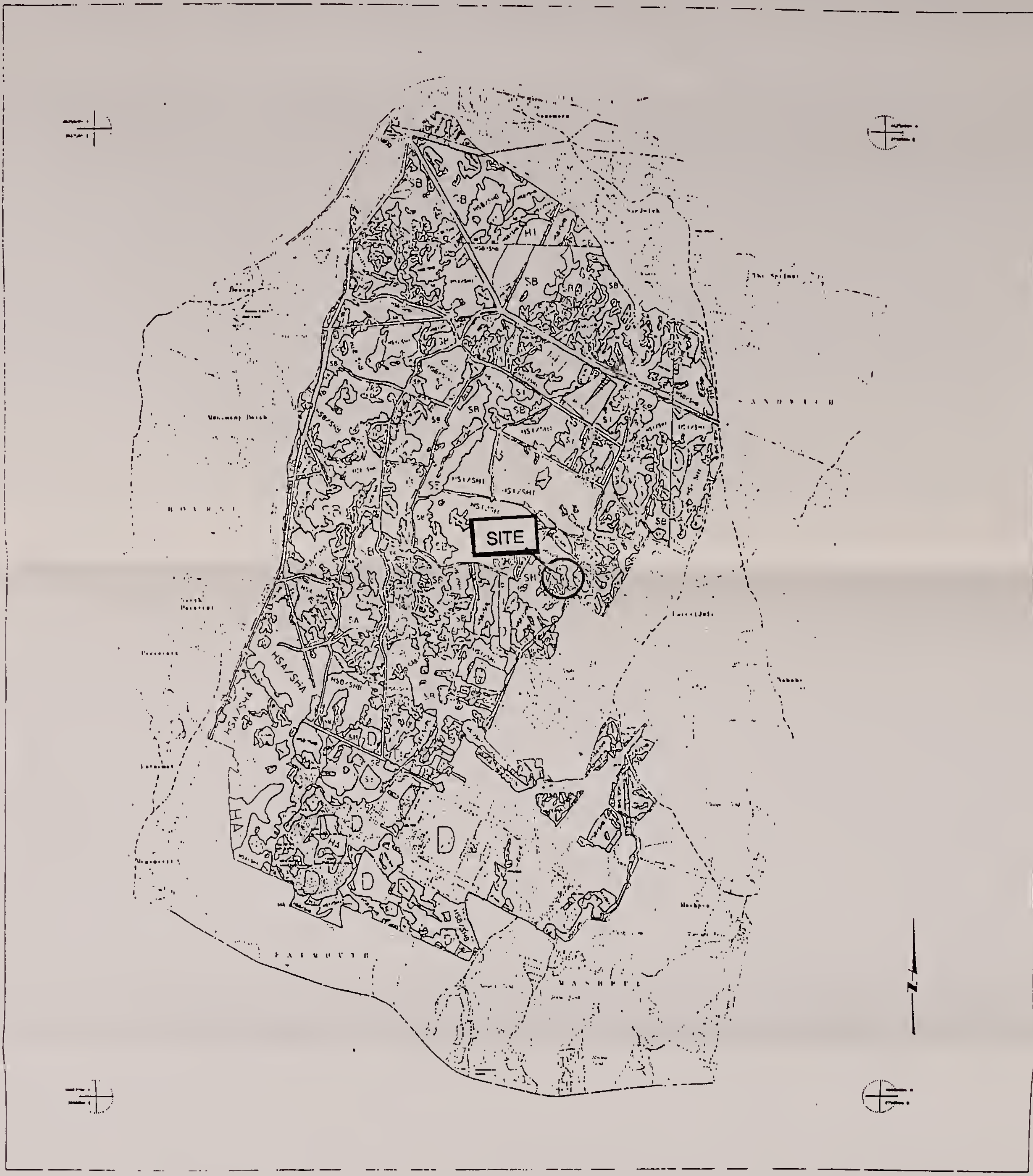
THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS MILITARY DIVISION
FACILITIES ENGINEERING

MAP 15
WILDLIFE AND FLORA

Date Prepared: March 1991

JMM James M Montgomery
Consulting Engineers, Inc.

Wayzata, Minnesota



LEGEND

MAP SYMBOL	DESCRIPTION
SA -	Forest Coniferous Dense
SB -	Forest Coniferous Open to Medium Density
SI -	Scrub Coniferous Open to Dense
HSA SHA -	Forest Mixed Dense
HSB SHB -	Forest Mixed Open to Medium Density
HSI SHI -	Scrub Mixed Open to Dense
HA -	Forest Deciduous Dense
HB -	Forest Deciduous Open to Medium Density
HI -	Scrub Deciduous Open to Dense
[illegible] -	Open / Grassland
W -	Water / Wetland
D -	Developed

Scale

THE COMMONWEALTH OF MASSACHUSETTS
MASSACHUSETTS MILITARY DIVISION
FACILITIES ENGINEERING

MAP 12
VEGETATION TYPE /DENSITY

Data Source:
MacConnell, William P., 1971 Land Use and Vegetative Cover Mapping.
Department of Forestry and Wildlife Management.

Date Prepared: March 1991

JMM James M Montgomery
Consulting Engineers, Inc.

Wayzata, Minnesota

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CHEMICAL & BACTERIOLOGICAL ANALYSES
697-2650

June 30, 1988

TO Textron Defense Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

6/8/88

2 Well Water Samples - Bacteriological & Chemical Analysis @ $50.00/sample	110 ea $100.00
2 Well Water Samples - Trace Metals Examination @ $100.00/sample	100 $200.00
2 Well Water Samples - Total Volatile Organics @ $200.00/sample	130 ea $400.00
1 hour collection time	$ 20.00
Total	$720.00

Collected from Building J3-1 and J3-6 Otis Air Force Base - Bourne, Mass.

P.O. # 399235

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June 28, 1988

Textron Defense Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

Subject: Well Water - Existing Well
Collected from Building J3-1 - Otis Air Force Base - Bourne, Mass.

	mg/l.	Maximum Contaminant Level mg/l.
Arsenic (As)	L 0.002	0.05
Barium (Ba)	L 0.10	1.00
Cadmium (Cd)	L 0.001	0.01
Total Chromium	L 0.01	0.05
Lead (Pb)	L 0.01	0.05
Mercury (Hg)	L 0.0005	0.002
Selenium (Sc)	L 0.002	0.01
Silver (Ag)	L 0.002	0.05
Fluoride	0.20	1.40
Copper (Cu)	0.208	1.00

L = less than

Methodology:

Metals - Atomic Absorption Spectrometry

Arsenic, Mercury, & Selenium - Atomic Absorption Spectrometry with hydride system

Fluoride - SPADN

On site collection made by R. Perry of Oliveira Laboratories - 6/9/88 at 1:07 P.M.

[illegible] Oliveira

Oliveira
Director

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June 28, 1988

Textron Defense Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

Subject: Well Water - Existing Well
Collected from Building J3-1 - Otis Air Force Base - Bourne, Mass.

Analysis Number 5175

EPA Method 524

Compound	MDL*	Conc.*	Compound	MDL*	Conc.
Benzene	0.15	0.93 ug/L	trans-1,2 Dichloroethylene	0.25	ND
Carbontetrachloride	0.25	ND	cis-1,2, Dichloroethylene	0.25	ND
1,1-Dichloroethylene	0.20	ND	Dichloromethane	0.25	ND
1,2-Dichloroethane	0.25	ND	1,1 Dichloroethane	0.20	ND
para Dichlorobenzene	0.25	ND	1,1 Dichloropropene	0.20	ND
Trichloroethylene	0.20	ND	1,3 Dichloropropene	0.25	ND
1,1,1 Trichloroethane	0.20	ND	1,2 Dichloropropane	0.20	ND
Vinyl Chloride	1.0	ND	1,3 Dichloropropane	0.20	ND
Bromobenzene	0.25	ND	2,2 Dichloropropane	0.20	ND
Bromodichloromethane	0.25	ND	Ethylbenzene	0.20	ND
Bromoform	0.50	ND	Styrene	0.25	ND
Bromomethane	1.0	ND	1,1,2 Trichloroethane	0.20	ND
Chlorobenzene	0.20	ND	1,1,1,2 Tetrachloroethane	0.25	ND
Chlorodibromomethane	0.25	ND	1,1,2,2 Tetrachloroethane	0.20	ND
Chloroethane	1.0	ND	Tetrachloroethylene	0.20	ND
Chloroform	0.20	0.60 ug/L	1,2,3 Trichloropropane	0.25	ND
Chloromethane	1.0	ND	Toluene	0.20	ND
o-Chlorotoluene	0.20	ND	p-Xylene	0.20	ND
p-Chlorotoluene	0.20	ND	o-Xylene	0.20	ND
Dibromomethane	0.20	ND	m-Xylene	0.20	ND
m-Dichlorobenzene	0.25	ND	Ethylene Dibromide (EDB)	0.20	ND
o-Dichlorobenzene	0.25	ND	1,2 Dibromo-3-chloropropane	0.25	ND

Compound	MDL*	Conc.*
Bromochloromethane	0.20	ND
n-Butylbenzene	0.25	ND
Dichlorodifluoromethane	1.0	ND
Fluorotrichloromethane	1.0	ND
Hexachlorobutadiene	0.25	ND
Isopropylbenzene	0.20	ND
p-Isopropyltoluene	0.25	ND
Napthalene	1.0	ND
n-Propylbenzene	0.25	ND
Sec-butylbenzene	0.20	ND
Tert-butylbenzene	0.20	ND
1,2,3 Trichlorobenzene	0.30	ND
1,2,4 Trichlorobenzene	0.30	ND
1,2,4 Trimethylbenzene	0.30	ND
1,3,5 Trimethylbenzene	0.30	ND

Notes: ND = Below minimum detectable level (MDL)
* = ug/l

Tested by Lab #MA052

On site collection made by R. Perry of Oliveira Laboratories - 6/9/88 at 1:07 P.M.

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(508) 697-2650

June 28, 1988

Textron Defense Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

Subject: Well Water - Existing Well
Collected from Building J3-1 - Otis Air Force Base - Bourne, Mass.

Coliform Count /100 ml @ 35 C Membrane Filter	0
S.P.C./ml @ 35 C	10

Color (APC units)	0.00
Sediment	none
Turbidity (NTU)	0.34
Odor	none
Taste	satisfactory
pH	6.20
Specific Conductance micromhos/cm	50.0

mg /liter

Total Alkalinity ($CaCO_3$)	8.00
Free CO_2	9.84
Total Hardness ($CACO_3$)	12.0
Calcium (Ca)	4.80
Magnesium (Mg)	0.00
Sodium (Na)	5.15
Potassium (K)	0.60
Total Iron (Fe)	0.05
Manganese (Mn)	L 0.01
Silica (SiO_2)	8.80
Sulfate (SO_4)	12.0
Chloride (Cl)	7.50
Nitrogen - Ammonia	0.08
Nitrogen - Nitrite	0.003
Nitrogen - Nitrate	L 0.10
Copper (Cu)	

L = less than

On site collection made by R. Perry of Oliveira Laboratories - 6/9/88 at 1:07 P.M.

Bacteriologically, this well water is of a satisfactory sanitary standard and is suitable for drinking and domestic purposes.

Chemically, this well water meets the standards for all the chemicals tested.

Director

The Standard Plate Count indicated the general bacterial population of the well at the time of collection.

Coliform Group Bacteria:

Significance

The coliform group bacteria includes organisms found in the intestinal tracts of warm blooded animals, birds, decaying organic matter (hay, leaves, wood, etc.), the top 2 to 3 feet of the soil, lakes, ponds, brooks, rivers, drainage and types of vegetation.

Because the organisms can cause some illness; because the presence of coliform organisms in the water suggests that other more harmful organisms may be present, water containing one or more coliform group bacteria per 100 ml of sample should not be used for drinking or cooking purposes unless boiled 5 minutes or disinfected by other means.

This bacteria is of animal origin (intestinal tract) and may be considered as closely associated with disease causing organisms. On this factor, none should be present.

Color — APC Units - Ground water ought to be practically free from color. For attractive water - color should not exceed 15 units.

Turbidity — NT Units - Recommended limit not to exceed 5 units.

Odor & Taste — For water to be of high quality, the water should be odor free and taste good.

pH — The pH value defines the concentration of free hydrogen ions in solution. Expressed on a scale extending from 0 or very acid to 14 or very alkaline with 7.0 being neutral.

Specific Conductance — Conductivity is a good criterion for measuring the degree of mineralization and assessing the affect of diverse ions on chemical equilibria..

Total Alkalinity — The alkalinity of this water represents its content of carbonates and bicarbonates.

Free Carbon Dioxide — Well water having a low pH and a Free CO_2 level in excess of 50. mg/l will be corrosive to iron, bronze, brass and copper tubing and fittings.

Total Hardness — Standard not to exceed 50. mg/l. Waters having a hardness level of 50 to 100 are in the medium hardness range, over 100 very hard.

Calcium — Calcium contributes to the total hardness of water. Appreciable amounts of calcium salts break down on heating and form scale in boilers, pipes and cooking utensils.

Magnesium — Magnesium is a common constituent of natural water. Magnesium and calcium ions are principal contributors to water hardness. Concentrations in excess of 125 mg/l can exert a cathartic and diuretic action.

Sodium — Recommended limit not to exceed 20 mg/l.

Potassium — Potassium concentrations in drinking water seldom exceed 20. mg/l.

Total Iron — Standard not to exceed 0.3 mg/l.

Manganese — Standard not to exceed 0.05 mg/l. The principal reason for limiting the concentration of manganese is to reduce esthetic and economic problems.

Silica — Silica content of natural water is most commonly in the 1 to 30 mg/l. Silica in water is undesirable because it forms difficult to remove silica scales.

Sulfates — Standard not to exceed 250 mg/l.

Chloride — Standard not to exceed 250 mg/l.

Nitrogen — Ammonia is present in variable concentrations in many surface and ground waters. Its occurrence in ground water is genera result of natural reduction processes.

Nitrogen - Nitrite — Nitrite in water poses a health hazard, but fortunately seldom occurs in high concentrations. Waters with a nit nitrite concentration over 1 mg/l should not be used for infant feeding.

Nitrogen - Nitrate — Standard not to exceed 10. mg/l. Nitrate, in high concentrations can and do cause methemoglobinemia or s nitrate poisoning in infants. Water with 10 or more mg/l of nitrate is unsatisfactory and is not considered safe for drinking o ing. It is especially dangerous to children and should never be used in infant formulas.

Copper — Standard not to exceed 1.0 mg/l.

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June 28, 1988

extron Defense Systems
)1 Lowell Street
lmington, Mass. 01887-2971

bject: Well Water - Existing Well
Collected from Building J3-6 - Otis Air Force Base - Bourne, Mass.

	mg/l.	Maximum Contaminant Level mg/l.
rsenic (As)	L 0.002	0.05
rium (Ba)	L 0.10	1.00
dmium (Cd)	L 0.001	0.01
tal Chromium	L 0.01	0.05
ead (Pb)	L 0.01	0.05
rcury (Hg)	L 0.005	0.002
lenium (Sc)	L 0.002	0.01
lver (Ag)	L 0.002	0.05
uoride	0.15	1.40
pper (Cu)	0.630	1.00

= less than

ethodology:

etals - Atomic Absorption Spectrometry

rsenic, Mercury, & Selenium - Atomic Absorption Spectrometry with hydride system

luoride - SPADN

n site collection made by R. Perry of Oliveira Laboratories - 6/9/88 at 1:07 P.M.

Director

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June 28, 1988

Textron Defense Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

Subject: Well Water - Existing Well
Collected from Building J3-6 - Otis Air Force Base - Bourne, Mass.

Analysis Number 5175

EPA Method 524

Compound	MDL*	Conc.*	Compound	MDL*	Conc.*
Benzene	0.15	0.56 ug/L	trans-1,2 Dichloroethylene	0.25	ND
Carbontetrachloride	0.25	ND	cis-1,2, Dichloroethylene	0.25	ND
1,1-Dichloroethylene	0.20	ND.	Dichloromethane	0.25	ND
1,2-Dichloroethane	0.25	ND	1,1 Dichloroethane	0.20	ND
para Dichlorobenzene	0.25	ND	1,1 Dichloropropene	0.20	ND
Trichloroethylene	0.20	ND	1,3 Dichloropropene	0.25	ND
1,1,1 Trichloroethane	0.20	ND	1,2 Dichloropropane	0.20	ND
Vinyl Chloride	1.0	ND	1,3 Dichloropropane	0.20	ND
Bromobenzene	0.25	ND	2,2 Dichloropropane	0.20	ND
Bromodichloromethane	0.25	ND	Ethylbenzene	0.20	ND
Bromoform	0.50	ND	Styrene	0.25	ND
Bromomethane	1.0	ND	1,1,2 Trichloroethane	0.20	ND
Chlorobenzene	0.20	ND	1,1,1,2 Tetrachloroethane	0.25	ND
Chlorodibromomethane	0.25	ND	1,1,2,2 Tetrachloroethane	0.20	ND
Chloroethane	1.0	ND	Tetrachloroethylene	0.20	ND
Chloroform	0.20	ND	1,2,3 Trichloropropane	0.25	ND
Chloromethane	1.0	ND	Toluene	0.20	ND
o-Chlorotoluene	0.20	ND	p-Xylene	0.20	ND
p-Chlorotoluene	0.20	ND	o-Xylene	0.20	ND
Dibromomethane	0.20	ND	m-Xylene	0.20	ND
m-Dichlorobenzene	0.25	ND	Ethylene Dibromide (EDB)	0.20	ND
o-Dichlorobenzene	0.25	ND	1,2 Dibromo-3-chloropropane	0.25	ND

Compound	MDL*	Conc.*
Bromochloromethane	0.20	ND
n-Butylbenzene	0.25	ND
Dichlorodifluoromethane	1.0	ND
Fluorotrichloromethane	1.0	ND
Hexachlorobutadiene	0.25	ND
Isopropylbenzene	0.20	ND
p-Isopropyltoluene	0.25	ND
Napthalene	1.0	ND
n-Propylbenzene	0.25	ND
Sec-butylbenzene	0.20	ND
Tert-butylbenzene	0.20	ND
1,2,3 Trichlorobenzene	0.30	ND
1,2,4 Trichlorobenzene	0.30	ND
1,2,4 Trimethylbenzene	0.30	ND
1,3,5 Trimethylbenzene	0.30	ND

Notes: ND = Below minimum detectable level (MDL)
* = ug/l

Tested by Lab #MA052

On site collection made by R. Perry of Oliveira Laboratories – 6/9/88 at 1:07 P.M.

Director

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June 28, 1988

Textron Defense Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

Subject: Well Water - Existing Well

Collected from Building J3-6 - Otis Air Force Base - Bourne, Mass.

Coliform Count /100 ml @ 35 C Membrane Filter	0
S.P.C./ml @ 35 C	8

Color (APC units)	0.00
Sediment	none
Turbidity (NTU)	0.30
Odor	none
Taste	satisfactory
pH	6.10
Specific Conductance micromhos/cm	65.0

mg /liter

Total Alkalinity ($CaCO_3$)	7.00
Free CO_2	10.78
Total Hardness ($CACO_3$)	30.0
Calcium (Ca)	9.60
Magnesium (Mg)	1.46
Sodium (Na)	5.60
Potassium (K)	0.68
Total Iron (Fe)	0.05
Manganese (Mn)	L 0.01
Silica (SiO_2)	7.75
Sulfate (SO_4)	1.50
Chloride (Cl)	9.50
Nitrogen - Ammonia	0.14
Nitrogen - Nitrite	0.002
Nitrogen - Nitrate	3.45
Copper (Cu)	

L = less than

On site collection made by R. Perry of Oliveira Laboratories - 6/9/88 at 1:07 P.M.

Bacteriologically, this well water is of a satisfactory sanitary standard and is suitable for drinking and domestic purposes.

Chemically, this well water meets the standards for all the chemicals tested.

Director

The Standard Plate Count indicated the general bacterial population of the well at the time of collection.

Coliform Group Bacteria:

Significance

The coliform group bacteria includes organisms found in the intestinal tracts of warm blooded animals, birds, decaying organic matter (hay, leaves, wood, etc.), the top 2 to 3 feet of the soil, lakes, ponds, brooks, rivers, drainage and types of vegetation.

Because the organisms can cause some illness; because the presence of coliform organisms in the water suggests that other more harmful organisms may be present, water containing one or more coliform group bacteria per 100 ml of sample should not be used for drinking or cooking purposes unless boiled 5 minutes or disinfected by other means.

This bacteria is of animal origin (intestinal tract) and may be considered as closely associated with disease causing organisms. On this factor, none should be present.

Color — APC Units - Ground water ought to be practically free from color. For attractive water - color should not exceed 15 units.

Turbidity — NT Units - Recommended limit not to exceed 5 units.

Odor & Taste — For water to be of high quality, the water should be odor free and taste good.

pH — The pH value defines the concentration of free hydrogen ions in solution. Expressed on a scale extending from 0 or very acid to 14 or very alkaline with 7.0 being neutral.

Specific Conductance — Conductivity is a good criterion for measuring the degree of mineralization and assessing the affect of diverse ions on chemical equilibria.

Total Alkalinity — The alkalinity of this water represents its content of carbonates and bicarbonates.

Free Carbon Dioxide — Well water having a low pH and a Free CO_2 level in excess of 50. mg/l will be corrosive to iron, bronze, brass and copper tubing and fittings.

Total Hardness — Standard not to exceed 50. mg/l. Waters having a hardness level of 50 to 100 are in the medium hardness range, over 100 very hard.

Calcium — Calcium contributes to the total hardness of water. Appreciable amounts of calcium salts break down on heating and form scale in boilers, pipes and cooking utensils.

Magnesium — Magnesium is a common constituent of natural water. Magnesium and calcium ions are principal contributors to water hardness. Concentrations in excess of 125 mg/l can exert a cathartic and diuretic action.

Sodium — Recommended limit not to exceed 20 mg/l.

Potassium — Potassium concentrations in drinking water seldom exceed 20. mg/l.

Total Iron — Standard not to exceed 0.3 mg/l.

Manganese — Standard not to exceed 0.05 mg/l. The principal reason for limiting the concentration of manganese is to reduce esthetic and economic problems.

Silica — Silica content of natural water is most commonly in the 1 to 30 mg/l. Silica in water is undesirable because it forms difficult to remove silica scales.

Sulfates — Standard not to exceed 250 mg/l.

Chloride — Standard not to exceed 250 mg/l.

Nitrogen — Ammonia is present in variable concentrations in many surface and ground waters. Its occurrence in ground water is generally a result of natural reduction processes.

Nitrogen - Nitrite — Nitrite in water poses a health hazard, but fortunately seldom occurs in high concentrations. Waters with a nitrogen - nitrite concentration over 1 mg/l should not be used for infant feeding.

Nitrogen - Nitrate — Standard not to exceed 10. mg/l. Nitrate, in high concentrations can and do cause methemoglobinemia or so-called nitrate poisoning in infants. Watar with 10 or more mg/l of nitrate is unsatisfactory and is not considered safe for drinking or cooking. It is especially dangerous to children and should never be used in infant formulas.

Copper — Standard not to exceed 1.0 mg/l.

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BRIDGEWATER, MA 02324

OLIVEIRA ENVIRONMENTAL LABORATORIES, INC.
WATER - WASTEWATER - FOOD - DAIRY PRODUCTS
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Telephone (508) 697-2650
FAX (508) 697-0163

July 30, 1992

Textron Defense Systems
201 Lowell Street
Wilmington, MA 01887-2971

Source: Well Water - Existing Well

Collected from Building J3-6 Otis Air Force Base - Bourne, MA

	mg/l.	Maximum Contaminant Level mg/l.	Analytical Method
Arsenic (As)	L 0.002	0.05	EPA 206.3
Barium (Ba)	L 0.10	1.00	EPA 208.1
Cadmium (Cd)	L 0.001	0.01	EPA 213.1
Total Chromium	L 0.01	0.05	EPA 218.1
Copper (Cu)	2.35	1.00	EPA 220.1
Lead (Pb)	L 0.01	0.05	EPA 239.1
Mercury (Hg)	L 0.0005	0.002	245.1*
Selenium (Se)	L 0.002	0.01	EPA 270.3
Silver (Ag)	L 0.002	0.05	EPA 272.1
Fluoride (F)	0.27	4.00	EPA 340.1

L = less than

*EPA Modified/Hydride

On site collection made by R. Perry of Oliveira Laboratories - 7/21/92.

Oliveira
Director

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July 30, 1992

Textron Defense Systems
201 Lowell Street
Wilmington, MA 01887 - 2971

Source: Well Water - Existing Well

Collected from Building J3-6 - Otis Air Force Base - Bourne, MA

Analysis Number: 7658

Analysis Date: 7/29/29

Analyte	Result ug/l	MCL ug/l	Detection Limit ug/l	Analytical Method
Benzene	ND	5.0	0.1	503.1
Carbon Tetrachloride	ND	5.0	0.1	502.1
1,1-Dichloroethylene	ND	7.0	0.1	502.1
1,2-Dichloroethane	ND	5.0	0.1	502.1
para-Dichlorobenzene	ND	5.0	0.5	503.1
Trichloroethylene	ND	5.0	0.1	502.1 & 503.1
1,1,1-Trichloroethane	ND	200.	0.1	502.1
Vinyl Chloride	ND	2.0	0.1	502.1
Bromobenzene	ND		0.5	502.1 & 503.1
Bromodichloromethane	ND		0.1	502.1
Bromoform	ND		0.5	502.1
Bromomethane	ND		0.2	502.1 & 503.1
Chlorobenzene	ND		0.1	502.1
Chlorodibromomethane	ND		0.5	502.1
Chloroethane	ND		0.1	502.1
Chloroform	ND		0.1	502.1
Chloromethane	ND		0.1	502.1
o-Chlorotoluene	ND		0.1	502.1 & 503.1
p-Chlorotoluene	ND		0.1	502.1 & 503.1
Dibromomethane	ND		0.1	502.1
m-Dichlorobenzene	ND		0.5	502.1 & 503.1
o-Dichlorobenzene	ND		0.5	502.1 & 503.1
trans-1,2-Dichloroethylene	ND		0.1	502.1
cis-1,2-Dichloroethylene	ND		0.1	502.1
Dichloromethane	ND		0.1	502.1
1,1-Dichloroethane	ND		0.1	502.1
1,1-Dichloropropene	ND		0.1	502.1
1,3-Dichloropropene	ND		0.1	502.1
1,2-Dichloropropane	ND		0.1	502.1
1,3-Dichloropropane	ND		0.1	502.1
2,2-Dichloropropane	ND		0.1	502.1
Ethylbenzene	ND		0.1	503.1
Styrene	ND		0.1	503.1

Analyte	Result ug/l	MCL ug/l	Detection Limit ug/l	Analytical Method
1,1,2-Trichloroethane	ND		0.1	502.1
1,1,1,2-Tetrachloroethane	ND		0.1	502.1
1,1,2,2-Tetrachloroethane	ND		0.1	502.1
Tetrachloroethylene	ND		0.1	502.1 & 503.1
1,2,3-Trichloropropane	ND		0.1	502.1
Toluene	ND		0.1	503.1
p-Xylene	ND		0.5	503.1
o-Xylene	ND		0.5	503.1
m-Xylene	ND		0.5	503.1
Bromochloromethane	ND		0.1	502.1
n-Butylbenzene	ND		0.1	503.1
Dichlorodifluoromethane	ND		0.1	502.1
Fluorotrichloromethane	ND		0.1	502.1
Hexachlorobutadiene	ND		0.1	503.1
Isopropylbenzene	ND		0.1	503.1
p-Isopropyltoluene	ND		0.1	503.1
Naphthalene	ND		0.5	503.1
n-Propylbenzene	ND		0.1	503.1
Sec-butylbenzene	ND		0.1	503.1
Tert-butylbenzene	ND		0.1	503.1
1,2,3-Trichlorobenzene	ND		0.1	503.1
1,2,4-Trichlorobenzene	ND		0.1	503.1
1,2,4- Trimethylbenzene	ND		0.1	503.1
1,3,5-Trimethylbenzene	ND		0.1	503.1
Ethylene Dibromide (EDB)	ND		0.01	504
1,2-Dibromo-3-chloropropane (DBCP)	ND		0.01	504

MCL = Maximum Contaminant Level

Notes: ND = None Detected (Below minimum detectable level - MDL)

Tested by Lab #MA022

Surrogate Recoveries

Compound	% Recovered	QC Limits
2-Bromo-1-chloropropane	100	80-120
Fluorobenzene	101	80-120

On site collection made by R. Perry of Oliveira Laboratories - 7/21/92.

Director

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Telephone (508) 697-2650
FAX (508) 697-0163

July 30, 1992

Textron Defense Systems
01 Lowell Street
ilimington, MA 01887-2971

ource: Well Water – Existing Well

Collected from Building J3-6 – Otis Air Froce Base – Bourne, MA

liform Count /100 ml @ 35 C embrane Filter	0
S.P.C./ml 35 C	57
olor (APC units)	0.00
Sediment	none
Turbidity (NTU)	0.27
dor	none
aste	satisfactory
pH	6.00
pecific Conductance icromhos/cm	70.0

The Standard Plate Count indicated the general bacterial population of the well at the time of collection.

Coliform Group Bacteria:

Significance

The coliform group bacteria includes organisms found in the intestinal tracts of warm blooded animals, birds, decaying organic matter (hay, leaves, wood, etc.), the top 2 to 3 feet of the soil, lakes, ponds, brooks, rivers, drainage and types of vegetation.

Because the organisms can cause some illness; because the presence of coliform organisms in the water suggests that other more harmful organisms may be present, water containing one or more coliform group bacteria per 100 ml of sample should not be used for drinking or cooking purposes unless boiled 5 minutes or disinfected by other means.

This bacteria is of animal origin (intestinal tract) and may be considered as closely associated with disease causing organisms. On this factor, none should be present.

Color — APC Units - Ground water ought to be practically free from color. For attractive water · color should not exceed 15 units.

Turbidity — NT Units - Recommended limit not to exceed 5 units.

Odor & Taste — For water to be of high quality, the water should be odor free and taste good.

pH — The pH value defines the concentration of free hydrogen ions in solution. Expressed on a scale extending from 0 or very acid to 14 or very alkaline with 7.0 being neutral.

Specific Conductance — Conductivity is a good criterion for measuring the degree of mineralization and assessing the affect of diverse ions on chemical equilibria.

Total Alkalinity — The alkalinity of this water represents its content of carbonates and bicarbonates.

Free Carbon Dioxide — Well water having a low pH and a Free CO_2 level in excess of 50. mg/l will be corrosive to iron, bronze, brass and copper tubing and fittings.

Total Hardness — Standard not to exceed 50. mg/l. Waters having a hardness level of 50 to 100 are in the medium hardness range, over 100 very hard.

Calcium — Calcium contributes to the total hardness of water. Appreciable amounts of calcium salts break down on heating and form scale in boilers, pipes and cooking utensils.

Magnesium — Magnesium is a common constituent of natural water. Magnesium and calcium ions are principal contributors to water hardness. Concentrations in excess of 125 mg/l can exert a cathartic and diuretic action.

Sodium — Recommended limit not to exceed 20 mg/l.

Potassium — Potassium concentrations in drinking water seldom exceed 20. mg/l.

Total Iron — Standard not to exceed 0.3 mg/l.

Manganese — Standard not to exceed 0.05 mg/l. The principal reason for limiting the concentration of manganese is to reduce esthetic and economic problems.

Silica — Silica content of natural water is most commonly in the 1 to 30 mg/l. Silica in water is undesirable because it forms difficult to remove silica scales.

Sulfates — Standard not to exceed 250 mg/l.

Chloride — Standard not to exceed 250 mg/l.

Nitrogen — Ammonia is present in variable concentrations in many surface and ground waters. Its occurrence in ground water is generally a result of natural reduction processes.

Nitrogen - Nitrite — Nitrite in water poses a health hazard, but fortunately seldom occurs in high concentrations. Waters with a nitrogen - nitrite concentration over 1 mg/l should not be used for infant feeding.

Nitrogen - Nitrate — Standard not to exceed 10. mg/l. Nitrate, in high concentrations can and do cause methemoglobinemia or so-called nitrate poisoning in infants. Water with 10 or more mg/l of nitrate is unsatisfactory and is not considered safe for drinking or cooking. It is especially dangerous to children and should never be used in infant formulas.

Copper — Standard not to exceed 1.0 mg/l.

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July 30, 1992

Textron Defense Systems
201 Lowell Street
Wilimington, MA 01887-2971

Source: Well Water - Existing Well

Collected from Building J3-6 - Otis Air Froce Base - Bourne, MA

Coliform Count /100 ml @ 35 C Membrane Filter	0
S.P.C./ml @ 35 C	57

Color (APC units)	0.00
Sediment	none
Turbidity (NTU)	0.27
Odor	none
Taste	satisfactory
pH	6.00
Specific Conductance micromhos/cm	70.0

mg /liter

Total Alkalinity ($CaCO_3$)	8.00
Free CO_2	15.6
Total Hardness ($CACO_3$)	26.0
Calcium (Ca)	4.00
Magnesium (Mg)	3.90
Sodium (Na)	5.80
Potassium (K)	0.69
Total Iron (Fe)	0.10
Manganese (Mn)	L 0.01
Silica (SiO_2)	5.90
Sulfate (SO_4)	12.5
Chloride (Cl)	9.00
Nitrogen - Ammonia	0.04
Nitrogen - Nitrite	0.001
Nitrogen - Nitrate	1.80
Copper (Cu)	

L = less than

On site collection made by R. Perry of Oliveira Laboratories - 7/21/92.

Bacteriologically, this well water is of a satisfactory sanitary standard and is suitable for drinking and domestic purposes.

Chemically, this well water meets the standards for all of the chemicals tested.

Director

F83384-1

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(508) 697-2650

May 25, 1990

Textron Defense Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

Subject: Well Water - Existing Well

Collected from Building J3-6 - Otis Air Force Base - Bourne, Mass.

	mg/1.	Maximum Contaminant Level mg/1.
Arsenic (As)	L 0.002	0.05
Barium (Ba)	L 0.10	1.00
Cadmium (Cd)	L 0.001	0.01
Total Chromium	L 0.01	0.05
Copper (Cu)	0.64	1.00
Lead (Pb)	L 0.01	0.05
Mercury (Hg)	L 0.0005	0.002
Selenium (Se)	L 0.002	0.01
Silver (Ag)	L 0.002	0.05
Fluoride (F)	0.18	1.40

L = less than

Methodology:

Atomic Absorption Sepctrometry

Arsenic, Mercury, & Selenium - Atomic Absorption Spectrometry with Hydride System.

Fluoride - SPADN

On site collection made by R. Perry of Oliveira Laboratories - 5/15/90 at 9:52 A.M.

Victor Oliveira
Director

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May 25, 1990

Textron Defense Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

Subject: Well Water - Existing Well

Collected from Building J3-6 - Otis Air Force Base - Bourne, Mass.

Analysis Number 1682 EPA Method 503.1/Volatile Aromatic

Compound	Conc.*	MDL*
Benzene	ND	0.10
Trichloroethene	ND	0.10
Toluene	ND	0.10
Tetrachloroethene	ND	0.10
Ethylbenzene	ND	0.10
p-Xylene	ND	0.50
Chlorobenzene	ND	0.10
m-Xylene	ND	0.50
o-Xylene	ND	0.50
Isopropylbenzene	ND	0.10
Styrene	ND	0.10
n-Propylbenzene	ND	0.10
tert-Butylbenzene	ND	0.10
2-Chlorotoulene	ND	0.10
4-Chlorotoluene	ND	0.10
Bromobenzene	ND	0.50
sec-Butylbenzene	ND	0.10
1,3,5-Trimethylbenzene	ND	0.10
4-Isopropyltoluene	ND	0.10
1,2,4-Trimethylbenzene	ND	0.10
1,4-Dichlorobenzene	ND	0.50
1,3-Dichlorobenzene	ND	0.50

Compound	Conc.*	MDL*
n-Butylbenzene	ND	0.10
1,2-Dichlorobenzene	ND	0.50
Hexachlorobutadiene	ND	0.10
1,2,4-Trichlorobenzene	ND	0.10
Naphthalene	ND	0.50
1,2,3-Trichlorobenzene	ND	0.10

Note: ND = Below minimum detectable level (MDL)
* = ug/l

Tested by Lab #MA022

On site collection made by R. Perry of Oliveira Laboratories - 5/15/90 at 9:52 A.M.

Oliveira
Director

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CHEMICAL & BACTERIOLOGICAL ANALYSES
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May 25, 1990

Textron Defense Systems
01 Lowell Street
ilmington, Mass. 01887-2971

ubject: Well Water - Existing Well

Collected from Building J3-6 - Otis Air Force Base - Bourne, Mass.

Analysis Number 1682 EPA Method 502.1/Purgeable Halocarbons

mpound	Conc.*	MDL*
Chloromethane	ND	0.10
omomethane	ND	0.20
Dichlorodifluoromethane	ND	0.10
nyl Chloride	ND	0.10
hloroethane	ND	0.10
thylene Chloride	ND	0.10
ichlorofluoromethane	ND	0.10
1-Dichloroethene	ND	0.10
omochloromethane	ND	0.10
,1-Dichloroethane	ND	0.10
ns-1,2-Dichloroethene	ND	0.10
is-1,2-Dichloroethene	ND	0.10
oroform	ND	0.10
2-Dichloroethane	ND	0.10
romomethane	ND	0.10
,1-Trichloroethane	ND	0.10
rbon Tetrachloride	ND	0.10
modichloromethane	ND	0.10
2-Dichloropropane	ND	0.10
-Dichloropropene	ND	0.10
ichloroethene	ND	0.10
-Dichloropropane	ND	0.10
-Dichloropropane	ND	0.10

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May 25, 1990

Textron Defense Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

Subject: Well Water - Existing Well

Collected from Building J3-1 - Otis Air Force Base - Bourne, Mass.

Analysis Number 1681 EPA Method 502.1/Purgeable Halocarbons

Compound	Conc.*	MDL*
Chloromethane	ND	0.10
Bromomethane	ND	0.20
Dichlorodifluoromethane	ND	0.10
Vinyl Chloride	ND	0.10
Chloroethane	ND	0.10
Methylene Chloride	ND	0.10
Trichlorofluoromethane	ND	0.10
1,1-Dichloroethene	ND	0.10
Bromochloromethane	ND	0.10
1,1-Dichloroethane	ND	0.10
trans-1,2-Dichloroethene	ND	0.10
cis-1,2-Dichloroethene	ND	0.10
Chloroform	ND	0.10
1,2-Dichloroethane	ND	0.10
Dibromomethane	ND	0.10
1,1,1-Trichloroethane	ND	0.10
Carbon Tetrachloride	ND	0.10
Bromodichloromethane	ND	0.10
1,2-Dichloropropane	ND	0.10
1,1-Dichloropropene	ND	0.10
Trichloroethene	ND	0.10
1,3-Dichloropropane	ND	0.10
2,2-Dichloropropane	ND	0.10

Compound	Conc.*	MDL*
Dibromochloromethane	ND	0.50
1,1,2-Trichloroethane	ND	0.10
1,2-Dibromothane (EDB)	ND	0.10
Bromoform	ND	0.50
1,1,1,2-Tetrachloroethane	ND	0.10
1,2,3-Trichloropropane	ND	0.10
1,1,2,2-Tetrachloroethane	ND	0.10
Tetrachloroethene	ND	0.10
Chlorobenzene	ND	0.10
1,2-Dibromo-3-Chloropropane (DBCP)	ND	0.50
Bromobenzene	ND	0.50
2-Chlorotoluene	ND	0.10
4-Chlorotoluene	ND	0.10
1,3-Dichlorobenzene	ND	0.50
1,2-Dichlorobenzene	ND	0.50
1,4-Dichlorobenzene	ND	0.50

Note: ND = Below minimum detectable level (MDL)
* = ug/l

Tested by Lab #MA022

On site collection made by R. Perry of Oliveira Laboratories - 5/15/90 at 9:38 A.M.

Victor Oliveira
Director

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May 25, 1990

extron Defense Systems
1 Lowell Street
lmington, Mass. 01887-2971

bject: Well Water - Existing Well

Collected from Building J3-1 - Otis Air Force Base - Bourne, Mass.

nalysis Number 1681 EPA Method 503.1/Volatile Aromatic

mpound	Conc.*	MDL*
nzene	ND	0.10
richloroethene	ND	0.10
luene	ND	0.10
trachloroethene	ND	0.10
thylbenzene	ND	0.10
Xylene	ND	0.50
hlorobenzene	ND	0.10
Xylene	ND	0.50
-Xylene	ND	0.50
opropylbenzene	ND	0.10
tyrene	ND	0.10
Propylbenzene	ND	0.10
rt-Butylbenzene	ND	0.10
-Chlorotoulene	ND	0.10
-Chlorotoluene	ND	0.10
romobenzene	ND	0.50
c-Butylbenzene	ND	0.10
,3,5-Trimethylbenzene	ND	0.10
Isopropyltoluene	ND	0.10
,2,4-Trimethylbenzene	ND	0.10
4-Dichlorobenzene	ND	0.50
3-Dichlorobenzene	ND	0.50

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May 25, 1990

Textron Defence Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

Subject: Well Water - Existing Well

Collected from Building J3-1 - Otis Air Force Base - Bourne, Mass.

	mg/l.	Maximum Contaminant Level mg/l.
Arsenic (As)	L 0.002	0.05
Barium (Ba)	L 0.10	1.00
Cadmium (Cd)	L 0.001	0.01
Total Chromium	L 0.01	0.05
Copper (Cu)	0.21	1.00
Lead (Pb)	L 0.01	0.05
Mercury (Hg)	L 0.0005	0.002
Selenium (Se)	L 0.002	0.01
Silver (Ag)	L 0.002	0.05
Fluoride (F)	0.24	1.40

L = less than

Methodology:

Atomic Absorption Sepctrometry

Arsenic, Mercury, & Selenium - Atomic Absorption Spectrometry with Hydride System.

Fluoride - SPADN

On site collection made by R. Perry of Oliveira Laboratories - 5/15/90 at 9:38 A.M.

Victor Oliveira
Director

The Standard Plate Count indicated the general bacterial population of the well at the time of collection.

Coliform Group Bacteria:

Significance

The coliform group bacteria includes organisms found in the intestinal tracts of warm blooded animals, birds, decaying organic matter (hay, leaves, wood, etc.), the top 2 to 3 feet of the soil, lakes, ponds, brooks, rivers, drainage and types of vegetation.

Because the organisms can cause some illness; because the presence of coliform organisms in the water suggests that other more harmful organisms may be present, water containing one or more coliform group bacteria per 100 ml of sample should not be used for drinking or cooking purposes unless boiled 5 minutes or disinfected by other means.

This bacteria is of animal origin (intestinal tract) and may be considered as closely associated with disease causing organisms. On this factor, none should be present.

Color — APC Units - Ground water ought to be practically free from color. For attractive water - color should not exceed 15 units.

Turbidity — NT Units - Recommended limit not to exceed 5 units.

Odor & Taste — For water to be of high quality, the water should be odor free and taste good.

pH — The pH value defines the concentration of free hydrogen ions in solution. Expressed on a scale extending from 0 or very acid to 14 or very alkaline with 7.0 being neutral.

Specific Conductance — Conductivity is a good criterion for measuring the degree of mineralization and assessing the affect of diverse ions on chemical equilibria.

Total Alkalinity — The alkalinity of this water represents its content of carbonates and bicarbonates.

Free Carbon Dioxide — Well water having a low pH and a Free CO_2 level in excess of 50. mg/l will be corrosive to iron, bronze, brass and copper tubing and fittings.

Total Hardness — Standard not to exceed 50. mg/l. Waters having a hardness level of 50 to 100 are in the medium hardness range, over 100 very hard.

Calcium — Calcium contributes to the total hardness of water. Appreciable amounts of calcium salts break down on heating and form scale in boilers, pipes and cooking utensils.

Magnesium — Magnesium is a common constituent of natural water. Magnesium and calcium ions are principal contributors to water hardness. Concentrations in excess of 125 mg/l can exert a cathartic and diuretic action.

Sodium — Recommended limit not to exceed 20 mg/l.

Potassium — Potassium concentrations in drinking water seldom exceed 20. mg/l.

Total Iron — Standard not to exceed 0.3 mg/l.

Manganese — Standard not to exceed 0.05 mg/l. The principal reason for limiting the concentration of manganese is to reduce esthetic and economic problems.

Silica — Silica content of natural water is most commonly in the 1 to 30 mg/l. Silica in water is undesirable because it forms difficult to remove silica scales.

Sulfates — Standard not to exceed 250 mg/l.

Chloride — Standard not to exceed 250 mg/l.

Nitrogen — Ammonia is present in variable concentrations in many surface and ground waters. Its occurrence in ground water is generally a result of natural reduction processes.

Nitrogen - Nitrite — Nitrite in water poses a health hazard, but fortunately seldom occurs in high concentrations. Waters with a nitrogen - nitrite concentration over 1 mg/l should not be used for infant feeding.

Nitrogen - Nitrate — Standard not to exceed 10. mg/l. Nitrate, in high concentrations can and do cause methemoglobinemia or so-called nitrate poisoning in infants. Water with 10 or more mg/l of nitrate is unsatisfactory and is not considered safe for drinking or cooking. It is especially dangerous to children and should never be used in infant formulas.

Copper — Standard not to exceed 1.0 mg/l.

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OLIVEIRA ENVIRONMENTAL LABORATORIES, INC.
FOOD - DAIRY PRODUCTS - WATER - WASTEWATER
CHEMICAL & BACTERIOLOGICAL ANALYSES
(508) 697-2650

May 25, 1990

Textron Defense Systems
201 Lowell Street
Wilmington, Mass. 01887-2971

Subject: Well Water - Existing Well

Collected from Building J3-1 - Otis Air Force Base - Bourne, Mass.

Coliform Count /100 ml @ 35 C Membrane Filter	0
S.P.C./ml @ 35 C	L 1

Color (APC units)	0.00
Sediment	none
Turbidity (NTU)	0.32
Odor	none
Taste	satisfactory
pH	6.30
Specific Conductance micromhos/cm	58.0

mg /liter

Total Alkalinity (CaCO$_3$)	7.00
Free CO$_2$	0.97
Total Hardness (CACO$_3$)	10.0
Calcium (Ca)	1.60
Magnesium (Mg)	1.46
Sodium (Na)	6.80
Potassium (K)	0.48
Total Iron (Fe)	0.02
Manganese (Mn)	L 0.01
Silica (SiO$_2$)	4.00
Sulfate (SO$_4$)	7.50
Chloride (Cl)	8.50
Nitrogen - Ammonia	L 0.01
Nitrogen - Nitrite	0.003
Nitrogen - Nitrate	0.28
Copper (Cu)	

L = less than

On site collection made by R. Perry of Oliveira Laboratories - 5/15/90 at 9:38 A.M.

Bacteriologically, this well water is of a satisfactory sanitary standard and is suitable for drinking and domestic purposes.

Chemically, this well water meets the standards for the chemicals tested.

Director

VIA WINN[illegible]
3/19/86

A V C O

SYSTEMS DIVISION
201 Lowell Street
Wilmington, Massachusetts 01887

INTEROFFICE MEMORANDUM

TO D. Maynard

DATE 18 December 1984
F282-DP-84-208

FROM D. Parrella

SUBJECT Well Water Quality, Avco Ballistic Facility, Camp Edwards

COPY TO R. Clark, M. Cronin, R. Stephens, E. Thiboult, file

On 7 December 1984 Oliveria Environmental Laboratories, Inc. of Bridgewater, MA collected samples of water from both wells at Avco Ballistic Facility, Camp Edwards, MA. The upper well serves the shop (J-3-1), Melt-pour (J-3-3) and office trailer. Lower well serves Environmental (J-3-7) and Assembly (J-3-6) Buildings. Reports were recently reviewed. Chemically and bacteriologically this water is of a satisfactory standard for drinking and domestic purposes. Results of total volatile organics will be forth coming. Enclosed are reports which should be held on permanent record for future reference.

David Parrella mk
David Parrella
A.B.F Engineer

mak

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CHEMICAL & BACTERIOLOGICAL ANALYSES
697-2650

December 12, 1984

Avco Systems Division
Ballistic Test Facility
P.O. Box 900
Forest Dale, Mass. 02644

Subject: Bored Well with well point
(Lower Well)

Located on the Avco Systems Site - Otis Air Force Base - Camp Edwards - Bourne, Mass

	mg/l.	Maximum Contaminant Level mg/l.
Arsenic	L 0.002	0.05
Barium	L 0.10	1.00
Cadmium	L 0.001	0.010
Total Chromium	L 0.01	0.05
Lead	L 0.01	0.05
Mercury	L 0.0005	0.002
Selenium	L 0.002	0.01
Silver	L 0.002	0.05
Fluoride	L 0.05	2.0

	Methodology
Arsenic, Mercury, Selenium	Atomic Absorption - with Hydride System
Trace Metals	Atomic Absorption
Fluoride	SPADN

L = less than

On site collection made by V. Oliveira - 12/7/84 at 11:15 A.M.

Director

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FOOD - DAIRY PRODUCTS - WATER - WASTEWATER
CHEMICAL & BACTERIOLOGICAL ANALYSES
697-2650

December 12, 1984

Avco Systems Division
Ballistic Test Facility
P.O. Box 900
Forest Dale, Mass. 02644

Subject: Well Water - Bored Well with well point

(Upper Well)

Located on the Avco Systems Site - Otis Air Force Base - Camp Edwards - Bour
Mass.

	mg/1.	Maximum Contaminant Level mg/1.
Arsenic	L 0.002	0.05
Barium	L 0.01	1.00
Cadmium	L 0.001	0.010
Total Chromium	L 0.01	0.05
Lead	L 0.01	0.05
Mercury	L 0.0005	0.002
Selenium	L 0.002	0.01
Silver	L 0.002	0.05
Fluoride	L 0.05	2.0

	Methodology
Arsenic, Mercury, Selenium	Atomic Absorption - with Hydride System
Trace Metals	Atomic Absorption
Fluoride	SPADN

L = less than

On site collection made by V. Oliveira - 12/7/84 at 11:00 A.M.

Director

The Standard Plate Count indicated the general bacterial population of the well at the time of collection.

Coliform Group Bacteria:

Significance

The coliform group bacteria includes organisms found in the intestinal tracts of warm blooded animals, birds, decaying organic matter (hay, leaves, wood, etc.), the top 2 to 3 feet of the soil, lakes, ponds, brooks, rivers, drainage and types of vegetation.

Because the organisms can cause some illness; because the presence of coliform organisms in the water suggests that other more harmful organisms may be present, water containing one or more coliform group bacteria per 100 ml of sample should not be used for drinking or cooking purposes unless boiled 5 minutes or disinfected by other means.

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Turbidity — NT Units - Recommended limit not to exceed 5 units.

Odor & Taste — For water to be of high quality, the water should be odor free and taste good.

pH — The pH value defines the concentration of free hydrogen ions in solution. Expressed on a scale extending from 0 or very acid to 14 or very alkaline with 7.0 being neutral.

Specific Conductance — Conductivity is a good criterion for measuring the degree of mineralization and assessing the affect of diverse ions on chemical equilibria.

Total Alkalinity — The alkalinity of this water represents its content of carbonates and bicarbonates.

Free Carbon Dioxide — Well water having a low pH and a Free CO_2 level in excess of 50. mg/l will be corrosive to iron, bronze, brass and copper tubing and fittings.

Total Hardness — Standard not to exceed 50. mg/l. Waters having a hardness level of 50 to 100 are in the medium hardness range, over 100 very hard.

Calcium — Calcium contributes to the total hardness of water. Appreciable amounts of calcium salts break down on heating and form scale in boilers, pipes and cooking utensils.

Magnesium — Magnesium is a common constituent of natural water. Magnesium and calcium ions are principal contributors to water hardness. Concentrations in excess of 125 mg/l can exert a cathartic and diuretic action.

Sodium — Recommended limit not to exceed 20 mg/l.

Potassium — Potassium concentrations in drinking water seldom exceed 20. mg/l.

Total Iron — Standard not to exceed 0.3 mg/l.

Manganese — Standard not to exceed 0.05 mg/l. The principal reason for limiting the concentration of manganese is to reduce esthetic and economic problems.

Silica — Silica content of natural water is most commonly in the 1 to 30 mg/l. Silica in water is undesirable because it forms difficult to remove silica scales.

Sulfates — Standard not to exceed 250 mg/l.

Chloride — Standard not to exceed 250 mg/l.

Nitrogen — Ammonia is present in variable concentrations in many surface and ground waters. Its occurrence in ground water is generally a result of natural reduction processes.

Nitrogen - Nitrite — Nitrite in water poses a health hazard, but fortunately seldom occurs in high concentrations. Waters with a nitrogen - nitrite concentration over 1 mg/l should not be used for infant feeding.

Nitrogen - Nitrate — Standard not to exceed 10. mg/l. Nitrate, in high concentrations can and do cause methemoglobinemia or so-called nitrate poisoning in infants. Water with 10 or more mg/l of nitrate is unsatisfactory and is not considered safe for drinking or cooking. It is especially dangerous to children and should never be used in infant formulas.

Copper — Standard not to exceed 1.0 mg/l.

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CHEMICAL & BACTERIOLOGICAL ANALYSES
697-2650

December 12, 1984

Avco Systems Division
Ballistic Test Facility
P.O. Box 900
Forest Dale, Mass. 02644

Subject: Well Water - Bored Well with well point

(Upper Well)

Located on the Avco Systems Division Site - Otis Air Force Base - Camp Edwards Bourne, Mass.

Coliform Count /100 ml @ 35 C Membrane Filter	0
S.P.C./ml @ 35 C	50

Color (APC units)	0
Sediment	none
Turbidity (NTU)	0.42
Odor	none
Taste	metallic
pH	6.3
Specific Conductance micromhos/cm	85.

mg /liter

Total Alkalinity ($CaCO_3$)	14.0
Free CO_2	13.6
Total Hardness ($CACO_3$)	22.0
Calcium (Ca)	6.40
Magnesium (Mg)	1.46
Sodium (Na)	6.30
Potassium (K)	0.48
Total Iron (Fe)	0.80
Manganese (Mn)	L 0.01
Silica (SiO_2)	9.00
Sulfate (SO_4)	15.0
Chloride (Cl)	15.0
Nitrogen - Ammonia	0.15
Nitrogen - Nitrite	0.008
Nitrogen - Nitrate	0.94
Copper (Cu)	1.75

L = less than

On site collection made by V. Oliveira - 12/7/84 at 11:15 A.M.

Bacteriologically, this well water is of a satisfactory sanitary standard and is suitable for drinking and domestic purposes.

Chemically, this well water is high in iron content. The taste is affected by the high iron content. The high copper content is due to an acidic water attacking the copper tubing. This level is generally high in the first drawn water and then flushes out with usage. All other chemicals tested meet the standards.

Victor Oliveira
Director

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697-2860

December 12, 1984

Avco Systems Division
Ballistic Test Facility
P.O. Box 900
Forest Dale, Mass. 02644

Subject: Well Water - Bored Well with well point
(Lower Well)

Located on the Avco Systems Site - Otis Air Force Base - Camp Edward - Bourne, Mass.

Coliform Count /100 ml @ 35 C Membrane Filter	0
S.P.C./ml @ 35 C	27
Color (APC units)	0
Sediment	none
Turbidity (NTU)	0.27
Odor	none
Taste	satisfactory
pH	5.6
Specific Conductance micromhos/cm	110.
mg /liter	
Total Alkalinity ($CaCO_3$)	5.00
Free CO_2	24.7
Total Hardness ($CACO_3$)	20.0
Calcium (Ca)	4.00
Magnesium (Mg)	2.44
Sodium (Na)	8.60
Potassium (K)	0.72
Total Iron (Fe)	0.03
Manganese (Mn)	L 0.01
Silica (SiO_2)	8.80
Sulfate (SO_4)	8.00
Chloride (Cl)	13.0
Nitrogen - Ammonia	0.24
Nitrogen - Nitrite	0.008
Nitrogen - Nitrate	5.30
Copper (Cu)	0.30

L = less than

On site collection made by V. Oliveira - 12/7/84 at 11:00 A.M.

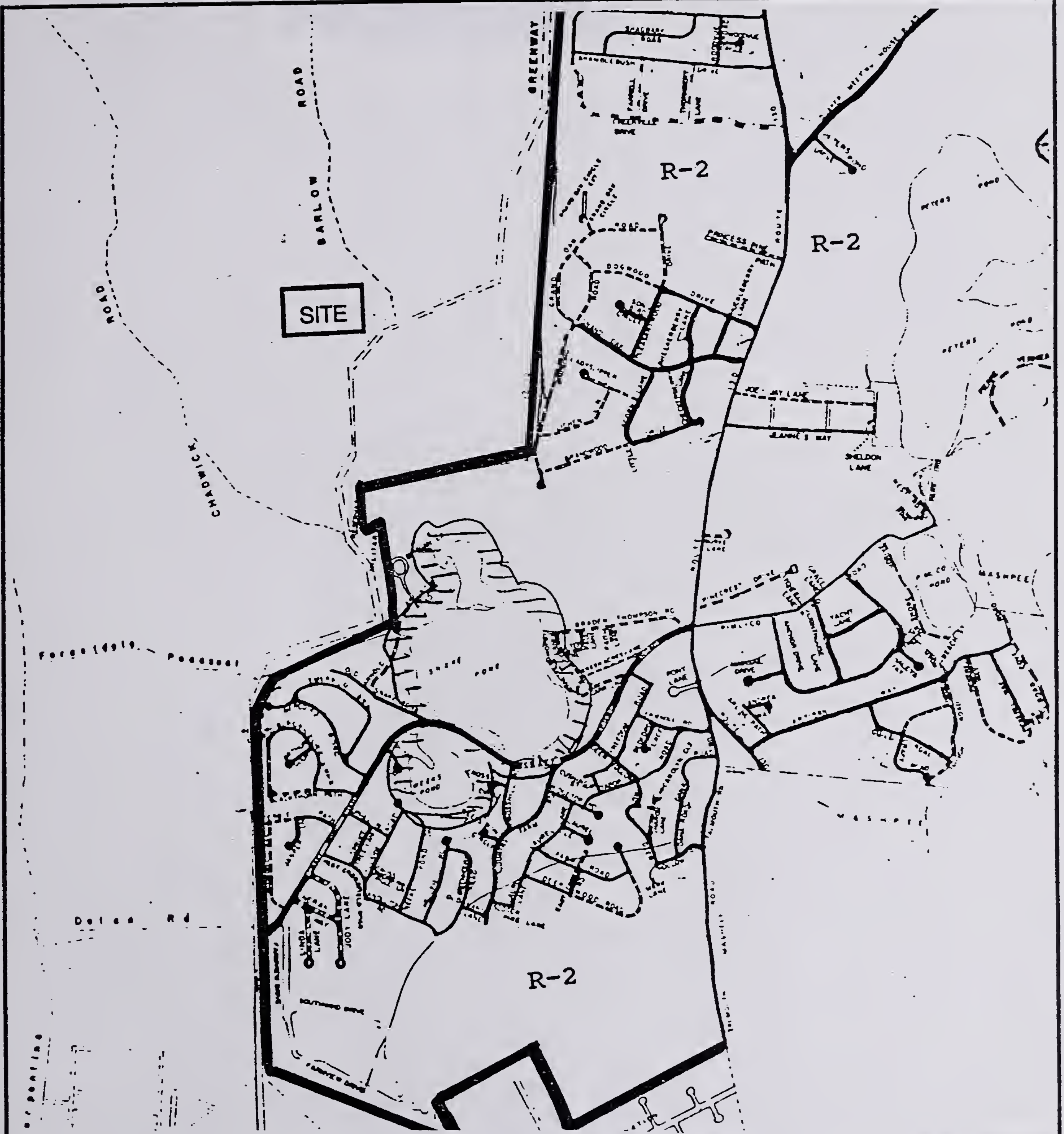
Bacteriologically, this well water is of a satisfactory sanitary standard and is suitable for drinking and domestic purposes.

Chemically, this well water is acidic and will be corrosive. All other chemicals tested meet the standards.

Director

APPENDIX F

ZONING MAP



SOURCE: Sandwich Town Map and Town Zoning Map By: Office of Town Engineer, Revised March 1989.

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FIGURE F-1

SURROUNDING LAND USE ZONING

Textron Cape Operations J-3 Range
Greenway Road
Otis Air Force Base, Sandwich, MA

DRAWN: JMG	DATE: November 29, 1993	PROJECT NO.: 6630-035	ARE 1
FILE NO.: tdsf1.flg	CHECKED: jmg		

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Massachusetts	Boston	(508) 635-9500
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	Mt. Laurel	(609) 234-5520
	Somerset	(908) 560-7323
North Carolina	Raleigh	(919) 571-0669
Pennsylvania	Pittsburgh	(412) 261-2910
South Carolina	Rock Hill	(803) 329-9690
Texas	Dallas	(214) 960-6855
	Houston	(713) 520-9900
Washington	Seattle	(206) 881-7700
Puerto Rico	San Juan	(809) 753-9509